

# Applied Biosystems SOLiD® EZ Bead™ Emulsifier

Catalog Number 4448419

Publication Part Number 4441486 Rev. E

Revision Date October 2011



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October 2011

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# About This Guide

## Purpose

This getting started guide provides the information that you need to prepare emulsions with the SOLiD® EZ Bead™ Emulsifier.

To use the SOLiD® System, DNA libraries to be sequenced require amplification on P1 Beads during emulsion PCR (ePCR), followed by enrichment of the templated beads. Templated bead preparation can be performed using the SOLiD® EZ Bead™ System:

- **SOLiD® EZ Bead™ Emulsifier:** To prepare emulsions containing library template and P1 Beads (see this guide).
- **SOLiD® EZ Bead™ Amplifier:** To perform emulsion PCR (ePCR) [refer to the *Applied Biosystems SOLiD® EZ Bead™ Amplifier Getting Started Guide* (Part no. 4443494)].
- **SOLiD® EZ Bead™ Enricher:** To wash and enrich the templated beads. After enrichment, perform a Terminal Transferase reaction to modify the 3' ends of the library [refer to the *Applied Biosystems SOLiD® EZ Bead™ Enricher Getting Started Guide* (Part no. 4443496)].

The enriched beads are deposited on a slide and the library sequenced (see [Figure 1](#)).

Figure 1 The SOLiD® EZ Bead™ System workflow



## Prerequisites

This service guide is intended for service personnel who have been specifically trained by Applied Biosystems. Applied Biosystems is not liable for damage or injury that results from the use of this manual by unauthorized or untrained parties.

This guide uses conventions and terminology that assume a working knowledge of the Microsoft® Windows® operating system, the Internet, and Internet-based browsers.

## Safety information

**Note:** For general safety information, see this section and [Appendix E, “Safety” on page 67](#). When a hazard symbol and hazard type appear by an instrument hazard, see the “Safety” Appendix for the complete alert on the instrument.

### Safety alert words

Four safety alert words appear in Life Technologies user documentation at points in the document where you need to be aware of relevant hazards. Each alert word — **IMPORTANT**, **CAUTION**, **WARNING**, **DANGER** — implies a particular level of observation or action, as defined below:

**IMPORTANT!** – Indicates information that is necessary for proper instrument operation, accurate chemistry kit use, or safe use of a chemical.

---

**CAUTION!** – Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

---

**WARNING!** – Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

---

**DANGER!** – Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.

---

Except for **IMPORTANT**s, each safety alert word in an Life Technologies document appears with an open triangle figure that contains a hazard symbol. *These hazard symbols are identical to the hazard symbols that are affixed to Applied Biosystems instruments (see “Safety symbols” on page 68).*

### SDSs




The Safety Data Sheets (SDSs) for any chemicals supplied by Applied Biosystems or Ambion are available to you free 24 hours a day. For instructions on obtaining SDSs, see “SDSs” on page 74.

**IMPORTANT!** For the SDSs of chemicals not distributed by Life Technologies or Ambion contact the chemical manufacturer.

### Safety labels on instruments

The following **CAUTION**, **WARNING**, and **DANGER** statements may be displayed on Life Technologies instruments in combination with the safety symbols described in the preceding section.



Hazard symbol	English	Français
	<b>CAUTION!</b> Hazardous chemicals. Read the Safety Data Sheets (SDSs) before handling.	<b>ATTENTION!</b> Produits chimiques dangereux. Lire fiche technique associée au produit avant toute manipulation.
	<b>CAUTION!</b> Hazardous waste. Refer to SDS(s) and local regulations for handling and disposal.	<b>ATTENTION!</b> Déchets dangereux. Lire fiche technique associée et prendre connaissance de la réglementation locale associées à la manipulation et l'élimination des déchets.
	<b>DANGER!</b> High voltage.	<b>DANGER!</b> Haute tension.
	<b>WARNING!</b> To reduce the chance of electrical shock, do not remove covers that require tool access. No user-serviceable parts are inside. Refer servicing to Life Technologies qualified service personnel.	<b>AVERTISSEMENT!</b> Pour éviter les risques d'électrocution, ne pas retirer les capots dont l'ouverture nécessite l'utilisation d'outils. L'instrument ne contient aucune pièce réparable par l'utilisateur. Toute intervention doit être effectuée par le personnel de service qualifié venant de chez Life Technologies.
	<b>CAUTION!</b> Pinch hazard.	<b>ATTENTION!</b> Risque de pincement.



# 1

## Choose the Scale of Preparation of Templated Beads, Prepare the Oil Master Mix, and Pre-rinse the Amplifier Pouch

This chapter provides information on how to choose the scale of preparation of templated beads and describes how to prepare Oil Master Mix and how to pre-rinse the SOLiD® EZ Bead™ Amplifier Pouch:

[“Review the general workflow to prepare and sequence a library” on page 12](#)



[“Choose the scale of preparation of templated beads” on page 13](#)



[“Before you begin” on page 13](#)



[“Prepare the Oil Master Mix” on page 14](#)



[“Pre-rinse the SOLiD® EZ Bead™ Amplifier Pouch” on page 16](#)








[Chapter 2, “Prepare and Run the Emulsifier \(E10\)” on page 17](#)

[Chapter 3, “Prepare and Run the Emulsifier \(E20\)” on page 25](#)

[Chapter 4, “Prepare and Run the Emulsifier \(E80\)” on page 33](#)

[Chapter 5, “Prepare and Run the Emulsifier \(E120\)” on page 41](#)

## Review the general workflow to prepare and sequence a library

Steps	References
Quantitate/Titrate the library	<i>5500 Series SOLiD® Systems Fragment Library Preparation User Guide</i> [Part no. 4460960] <i>5500 Series SOLiD® Systems Mate-Paired Library Preparation User Guide</i> [Part no. 4460958]
	
Emulsify the beads	<a href="#">“Prepare and Run the Emulsifier (E10)” on page 17</a> <a href="#">“Prepare and Run the Emulsifier (E20)” on page 25</a> <a href="#">“Prepare and Run the Emulsifier (E80)” on page 33</a> <a href="#">“Prepare and run the Emulsifier (E120)” on page 42</a>
	
Amplify the beads	<i>Applied Biosystems SOLiD® EZ Bead Amplifier Getting Started Guide</i> [Part no. 4443494]
	
Enrich the templated beads	<i>Applied Biosystems SOLiD® EZ Bead Enricher Getting Started Guide</i> [Part no. 4443494]
	
Modify the 3' ends of the DNA	<i>Applied Biosystems SOLiD® EZ Bead Enricher Getting Started Guide</i> [Part no. 4443494]
	
Deposit beads, perform bead sequencing	<i>5500 Series SOLiD® Sequencers Operation Guide</i> [Part no. 4456991]

## Choose the scale of preparation of templated beads

You can prepare templated beads according to the amount of library that you want to amplify :

Scale of preparation	Average yield of templated beads
E10	125 million
E20	250 million
E80	1 billion
E120	2.2 billion

## Materials and equipment required

See “[Ordering Information](#)” on page 49 for a list of equipment, kits, and consumables necessary for this procedure.

## Before you begin

- Construct the DNA library of interest [refer to *5500 Series SOLiD® Systems Fragment Library Preparation User Guide* (Part no. 4460960) and *5500 Series SOLiD® Systems Mate-Paired Library Preparation User Guide* (Part no. 4460958)].
- Prepare and quantitate the DNA library before proceeding with emulsion preparation [refer to *5500 Series SOLiD® Systems Fragment Library Preparation User Guide* (Part no. 4460960) and *5500 Series SOLiD® Systems Mate-Paired Library Preparation User Guide* (Part no. 4460958)].
- **Optional:** Titrate the library. The optimal titration point of most libraries is between 0.6 pM and 1.0 pM. We recommend starting with a titration point of 0.8 pM for a new library. Increase or decrease the titration as needed.
- Install the SOLiD EZ Bead Emulsifier in a different location than the location used to enrich the emulsion. Emulsification and enrichment in different locations prevent contamination of the sample. To prevent contamination, do not install the Emulsifier in the same room as the SOLiD EZ Bead Amplifier and SOLiD EZ Bead Enricher. For more information, refer to the *Applied Biosystems SOLiD® EZ Bead™ Emulsifier Site Preparation Guide* (Part no. 4452499) and the *Applied Biosystems SOLiD® EZ Bead™ Enricher Site Preparation Guide* (Part no. 4454036).

## Prepare the Oil Master Mix

**Note:** A single Emulsifier Oil Pack Kit (Part no. 4457185) yields approximately 240 mL of Oil Master Mix, which is six 50-mL Falcon® tubes containing 40-mL of Oil Master Mix each. The 240-mL of Oil Master Mix is enough for:

- E10 scale: 8 runs (E10 emulsions + E10 bag rinses)  
– OR –
- E20 scale: 6 runs (E20 emulsions + E20 bag rinses)  
– OR –
- E80 scale: 2 runs (E80 emulsions + E80 bag rinses)  
– OR –
- E120 scale: 2 runs (E120 emulsions + E120 bag rinse)

1. Prepare the Oil Master Mix in a 50-mL Falcon® tube.

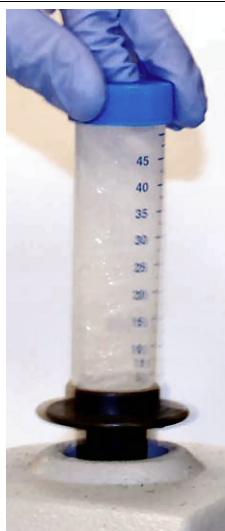
Item	Volume
Stabilizer 1	1.8 mL
Stabilizer 2	400 µL
Mineral oil	37.8 mL
<b>Total volume</b>	<b>40 mL</b>

- a. Use a 3-mL syringe to dispense 1.8 mL of Stabilizer 1 into the 50-mL Falcon® tube (see [Figure 1](#)). To ensure no air bubbles are in the syringe, aspirate some reagent into the syringe and fully dispense it back into the reagent bottle. Then slowly aspirate the correct volume.
- b. Use a 1-mL syringe to dispense 400 µL of Stabilizer 2 into the 50-mL Falcon® tube (see [Figure 1](#)). Make sure no air bubbles are in the syringe; follow the procedure in step 1a.

**Table 1** Syringes with Stabilizers 1 and 2

	
Stabilizer 1 (1.8 mL)	Stabilizer 2 (400 µL)

- c. Pour mineral oil (approximately 37.8 mL) into the tube that has Stabilizers 1 and 2 so that the final volume is 40 mL.
2. Cap the Falcon® tube. Use a vortexer to mix the solution so that a whirlpool down to the bottom of the tube is created (see [Figure Figure/table titles are not recommended in procedures.](#)). After the whirlpool has been created, continue to whirlpool-vortex the mixture for another 30 seconds.



Whirlpool created during vortexing. Correct method.



Whirlpool not created. Incorrect method.

3. Pour the mixture into the Oil Mix Bottle (in the Emulsifier Oil Pack Kit).
4. Repeat steps 1 through 3 FIVE additional times. Use a new 50-mL Falcon® tube each time.
5. After performing steps 1 through 3 a total of SIX times, you should have approximately 240 mL of Oil Master Mix in your Oil Mix Bottle.
6. Shake (by hand) the bottled mix for 30 seconds.
7. **If the Oil Master Mix will be used the same day:** De-gas at room temperature for at least 30 minutes in a dark location (such as in a cupboard or drawer).  
**If the Oil Master Mix will NOT be used the same day:** De-gas and store the Oil Master Mix at 4°C in a 4°C refrigerator.

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**STOPPING POINT** The Oil Master Mix can be stored at 4°C for up to two weeks. Before using the stored Oil Master Mix, shake (by hand) the bottled mix for 30 seconds. Let the Oil Master Mix reach room temperature and de-gas for 1 hour in a dark location (such as in a cupboard or drawer).

---

You have completed preparation of the SOLiD EZ Bead Oil Master Mix. Proceed to bead emulsification according to the scale of preparation that you want:

- [Chapter 2, “Prepare and Run the Emulsifier \(E10\)” on page 17](#)
- [Chapter 3, “Prepare and Run the Emulsifier \(E20\)” on page 25](#)
- [Chapter 4, “Prepare and Run the Emulsifier \(E80\)” on page 33](#)
- [Chapter 5, “Prepare and Run the Emulsifier \(E120\)” on page 41](#)

## Pre-rinse the SOLiD® EZ Bead™ Amplifier Pouch

**IMPORTANT!** The Oil Master Mix can be stored at 4 °C for up to two weeks. Before using the stored Oil Master Mix, shake (by hand) the bottled mix for 30 seconds. Let the Oil Master Mix reach room temperature and de-gas for 1 hour in a dark location (such as in a cupboard or drawer).

**IMPORTANT!** If you are amplifying the library with the SOLiD EZ Bead Amplifier, then pre-rinse the pouches used with the Amplifier before emulsifying the library.

1. Unscrew the cap from the nozzle of the SOLiD EZ Bead Amplifier Pouch.
2. Use a Pipet-Aid® pipette and a serological pipette of the appropriate volume to add Oil Master Mix to the Amplifier Pouch (see ).

**Volume of Emulsifier Reagents (E10, E20, E80, or E120) – Oil Master Mix to add to an Amplifier E-Small or E-Large Pouch**

Scale	Pouch to use	Volume of Oil Master Mix to add (mL)
E10, E20	SOLiD EZ Bead Amplifier E- <i>Small</i> Pouch	10
E80, E120	SOLiD EZ Bead Amplifier E- <i>Large</i> Pouch	20

3. Tightly screw the cap onto the nozzle of the Amplifier Pouch to ensure that the pouch does not leak.
4. Place the Amplifier Pouch on the bench top. Massage the pouch for 2 to 3 minutes to ensure that the Oil Master Mix coats the inner surface of the pouch.
5. Over a waste container, unscrew the cap(s), then drain the Oil Master Mix into the container.
6. Gently squeeze the Amplifier Pouch to expel any remaining Oil Master Mix from the pouch.
7. Drain the Amplifier Pouch upside-down for at least 20 minutes on a layer of clean lint-free wipes (Kimwipes® Cleaning Wipes). After draining the pouch, the pouch is ready for use.

**IMPORTANT!** Do *not* re-use Oil Master Mix from pre-rinsing.

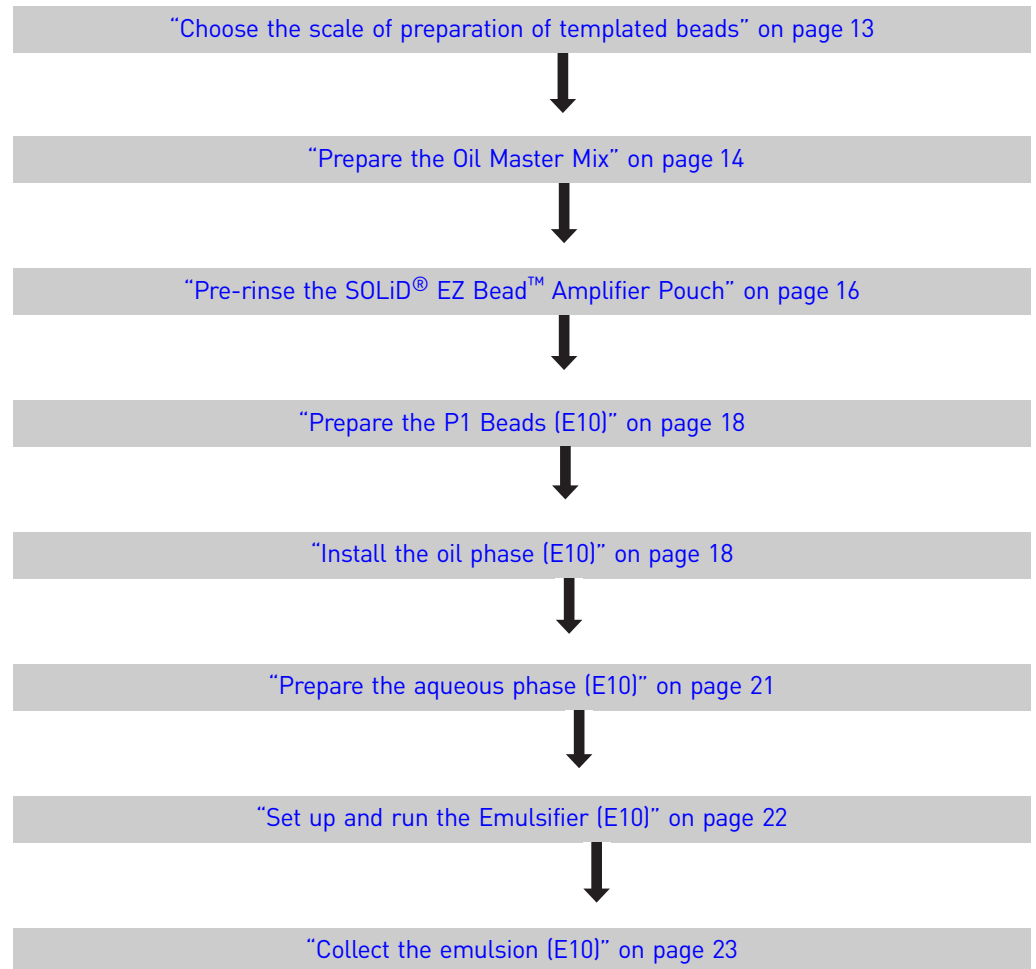
8. Screw the cap(s) tightly on the nozzle(s) until the Amplifier Pouches are ready for use. Use the pre-rinsed Amplifier Pouches the *same* day.



# 2

## Prepare and Run the Emulsifier (E10)

This chapter explains how to prepare and run the Emulsifier for the E10 scale:



## Prepare and run the Emulsifier (E10)

**Note:** You can thaw the Emulsifier reagents on ice as you prepare the P1 Beads and install the oil phase (see , [“Prepare the aqueous phase \(E10\)” on page 21](#)).

### Prepare the P1 Beads (E10)

1. If you are amplifying the library with the SOLiD EZ Bead Amplifier, then it is recommended to pre-rinse the pouches used with the Amplifier before emulsifying the library (see [“Pre-rinse the SOLiD® EZ Bead™ Amplifier Pouch” on page 16](#)).
2. Vortex and pulse-spin one tube of Emulsifier E10 – P1 Beads.
3. Ensure that the P1 Beads are completely resuspended, then pipet 220 µL of P1 Beads into a 1.5-mL DNA LoBind Tube.
4. Place the tube of beads in a magnetic rack for at least 1 minute. After the solution clears, remove and discard the supernatant.
5. Resuspend the beads in 220 µL Emulsifier E10 – BB Solution.
6. Sonicate the beads using the Bead Block Declump program on the Covaris® S2 System (for program conditions, see [“Bead Block Declump” on page 61](#)), then pulse-spin the tube.
7. Place the tube of beads in a magnetic rack for at least 1 minute. After the solution clears, remove and discard the supernatant.
8. Resuspend the beads in 220 µL of 1X TEX Buffer.
9. Store the beads at 4°C until ready for use.

### Install the oil phase (E10)

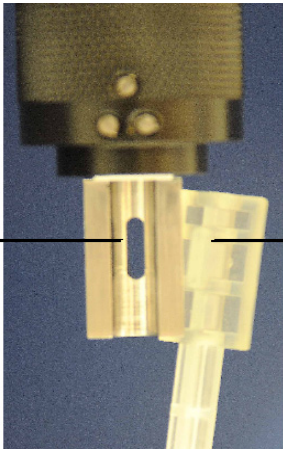
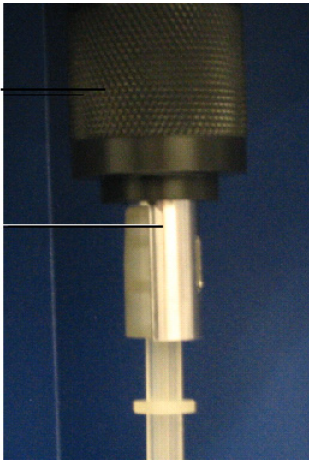
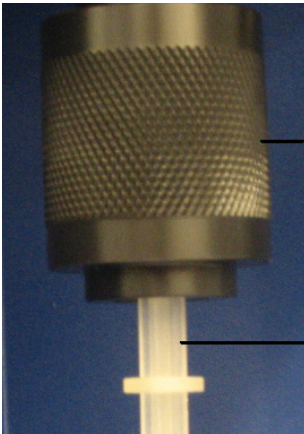
1. Unscrew and retain the cap with impeller of the Emulsifier E-Small Jar.
2. Tare the E-Small Jar on an analytical balance.
3. Pour 10.4 g of Oil Master Mix into the E-Small Jar (see [“Prepare the Oil Master Mix” on page 14](#)).
4. Screw the cap with the impeller on the E-Small Jar.
5. Install the jar on the Emulsifier:
  - a. Turn the knob clockwise to open the compartment door.
  - b. Pull the arm back at the base towards the opening of the compartment.
  - c. Slide the jar into the groove of the base of the compartment until the jar stops against the back of the groove.
  - d. Allow the arm to rest against the jar (see [Figure 2](#)).
  - e. Rotate the jar so that the port on the cap is to the left of the impeller shaft.

**Figure 2** The jar rests on the back of the groove and the arm is against the jar




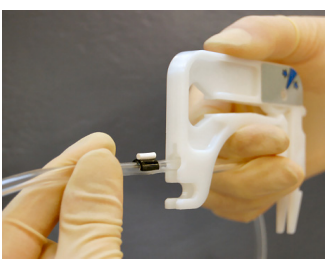

6. Fit the impeller head into the locking slot. Slide the coupler down until the coupler clicks to a stop to ensure that the impeller head is firmly in place in the coupler (see [Table 2](#)).

**Table 2** How to fit the impeller head into the locking slot

 <p>Locking slot</p> <p>Impeller head</p>	 <p>Coupler</p> <p>Impeller head</p>	 <p>Coupler</p> <p>Impeller</p>
<p>1. Align the locking slot with the impeller head.</p>	<p>2. Fit the impeller head into the groove below the coupler.</p>	<p>3. Slide the coupler over the impeller head.</p>

7. Attach the tubing with the Luer-Lok to the port of the cap.
8. Insert the 3-stop tubing with one stop in the pump cassette (see [Table 3](#)).

**Table 3** How to insert the tubing into the pump cassette

		
<p>1. Using your <i>right</i> hand, hold the pump cassette with your thumb and forefinger.</p> <p>2. Using your <i>left</i> hand, grasp the tubing with your thumb and forefinger above the black stop.</p>	<p>3. Pull the tubing slightly to slide the tubing into the pump cassette.</p> <p>4. Slide the tubing until the stop is aligned with the stop fixture on the outside edge of the pump cassette.</p>	<p>5. Pull the tubing slightly towards the inside of the pump cassette to fit the stop snugly into the fixture.</p>

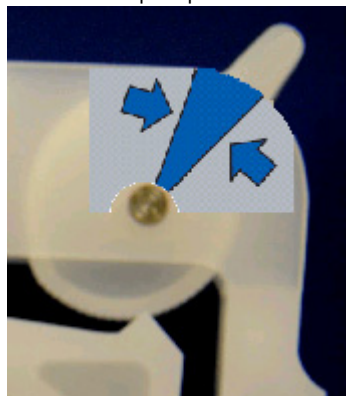
- a. Repeat step 8 to insert the tubing with the second stop at the other end of the pump cassette. Ensure that the tubing is in the inner groove opposite the second stop (see [Table 3](#)) and that the tubing is in the correct orientation (see [Figure 3](#)).

**Figure 3** Correct orientation of the Emulsifier Tubing



- b. Install the pump cassette into the roller-head of the pump (see [Figure 5 on page 21](#)).
- c. Turn the pinch wheel in the pump cassette counter-clockwise so that the mark is in the blue zone (see [Figure 4 on page 20](#)). This adjustment maintains correct tubing tension for normal pump operation.

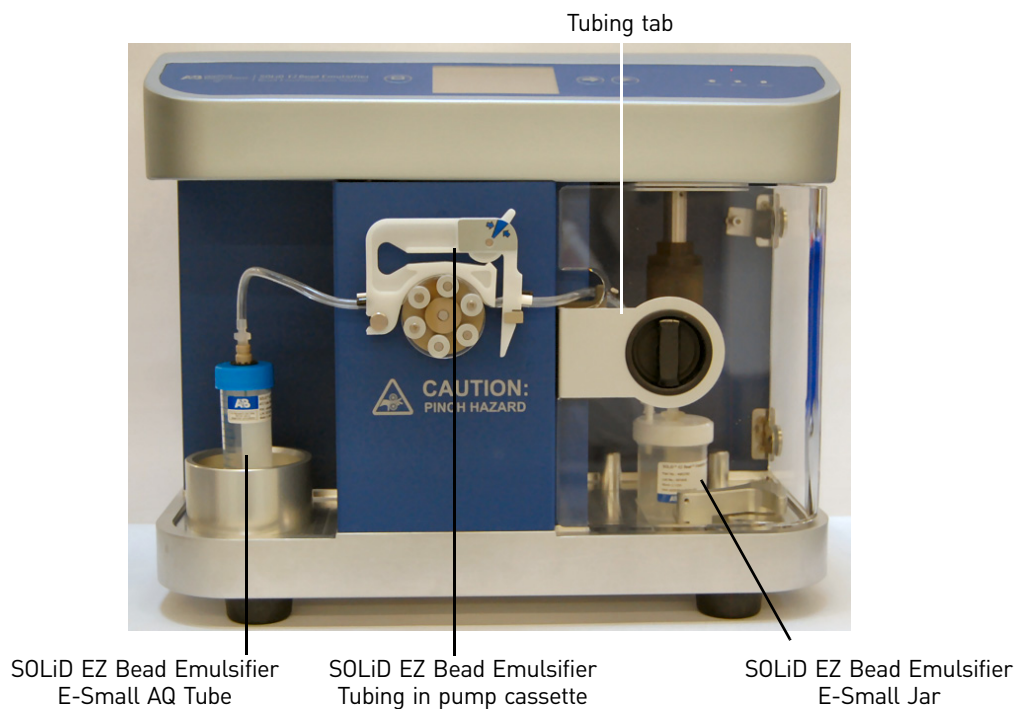
**Figure 4** Turn the pinch wheel in the pump cassette so that the mark is in the blue zone



9. Position the tubing so that it threads through the tubing tab (see [Figure 5](#)).

10. Close the door of the compartment, then turn the knob counter-clockwise to lock the door (see [Figure 5](#)).

**Figure 5** Placement of Emulsifier E-Small AQ Tube, Tubing, and E-Small Jar



## Prepare the aqueous phase (E10)

1. Thaw on ice:
  - Emulsifier E10 – P1 reagent, then vortex the reagent for a few seconds, and pulse-spin.
  - Emulsifier E10 – P2 reagent, then vortex the reagent for a few seconds, and pulse-spin.
  - Library template.

Place on ice:

Emulsifier E10 – Aqueous Master mix. Do *not* vortex

2. Place the Emulsifier E-Small AQ Tube on ice for filling.
3. Prepare a 1:10 dilution of P1 Reagent by adding 4  $\mu$ L of P1 reagent to 36  $\mu$ L of Low TE Buffer in a 1.5-mL DNA LoBind Tube.
4. Add the appropriate volume to the AQ Tube in this order:

E10 Reagent	Volume ( $\mu$ L)
Aqueous Master Mix	7400 - $X^{\dagger}$
1:10 diluted P1 Reagent	30.8
Undiluted P2 Reagent	46.2
Library template	$X$

$\dagger$   $X$  = Volume of library template. Use a Pipet-Aid<sup>®</sup> pipette fitted with a 10-mL serological pipette to dispense Aqueous Master Mix into the E-Small AQ Tube.

## Set up and run the Emulsifier (E10)

5. Screw on the cap to the AQ Tube, then swirl to mix the solution. Place the AQ Tube back on ice.

1. Power on the Emulsifier.
2. Ensure that the Oil Master Mix in the Emulsifier Jar is at room temperature.
3. Vortex, then pulse-spin the tube of prepared P1 beads.
4. Sonicate the prepared P1 Beads using the Covalent Declump 1 program on the Covaris® S2 System (for program conditions, see [“Covalent Declump 1” on page 61](#)), then pulse-spin the tube.

**IMPORTANT!** Perform steps 5 and 6 below as quickly as possible before the beads settle in the aqueous phase. If the beads settle before step 6, swirl the aqueous phase again, then perform step 6.

5. *Immediately* add the beads to the aqueous phase, then swirl the AQ Tube until the suspension is uniformly brown.
6. Immediately load the AQ Tube onto the Emulsifier, then attach the tubing to the cap of the AQ Tube (see [Figure 5 on page 21](#)). Ensure that the beads have not settled.



**CAUTION! PINCH HAZARD. Moving Parts. Moving parts can crush, pinch and cut. Keep hands clear of moving parts while operating the instrument. Disconnect power before servicing.**

7. Start the run:
  - a. Press the scale-selection button to select the E10 scale on the instrument key panel (see [Figure 6 on page 23](#)).
  - b. Press the start button . The motor starts and runs for ~10 seconds before the pump starts. The middle light on the panel is lit yellow.

**IMPORTANT!** Do *not* open the door of the emulsifier while a run is in progress. Opening the door automatically aborts the run, and the emulsion is not properly prepared. If you open the door in error, set up and prepare the emulsion again (see [“Prepare the P1 Beads \(E10\)” on page 18](#)).

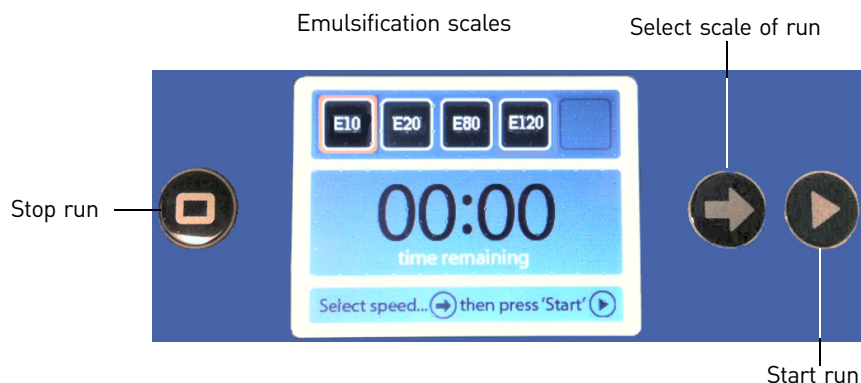
The run time is ~10 minutes. After the run is complete, the Emulsifier stops automatically, the right light on the panel is lit green, and the panel says, “Complete.”

**IMPORTANT!** To stop the run, press the stop button , then press the stop button *again* to confirm that you want to stop the run. The left light on the panel is lit red, and the panel says, “Run aborted.”

Stop the run only if the Emulsifier malfunctions. If you stop the run before the run is complete, then discard the emulsion because it is not properly prepared. Troubleshoot, if necessary (see [Appendix B, “Troubleshooting” on page 57](#)), then prepare and install the reagents again for the appropriate scale of emulsification.



**Figure 6** How to use the Emulsifier



Light color	Meaning
Green	Run is complete
Yellow	Instrument is running
Red	Run aborted, failed run, or error

## Collect the emulsion (E10)

1. Ensure that the run is finished. When the run is finished, the clock says "00:00."
2. Turn the knob clockwise to unlock the compartment door, then open the door.
3. Slide the coupler up and away from the impeller head.
4. Gently pull the impeller head from the coupler.
5. Swing out the arm at the base, then remove the impeller and the jar from the compartment.
6. Detach the tubing from the port on the cap of the jar.
7. Remove the pump cassette, tubing, and AQ Tube from the instrument as one unit.
8. To release the tubing from the pump cassette, turn the pinch wheel clockwise to the silver zone, then remove the tubing.
9. Discard the used AQ Tube and tubing. *Store the pump cassette on top of the Emulsifier.*  
**IMPORTANT!** The pump cassette is part of the instrument and is not disposable.
10. Close the door of the compartment, then turn the knob counter-clockwise to lock the door.
11. *Immediately* perform emulsion PCR (ePCR) on the emulsion using the SOLiD EZ Bead Amplifier [refer to the *Applied Biosystems SOLiD® EZ Bead™ Amplifier Getting Started Guide* (Part no. 4443494)].

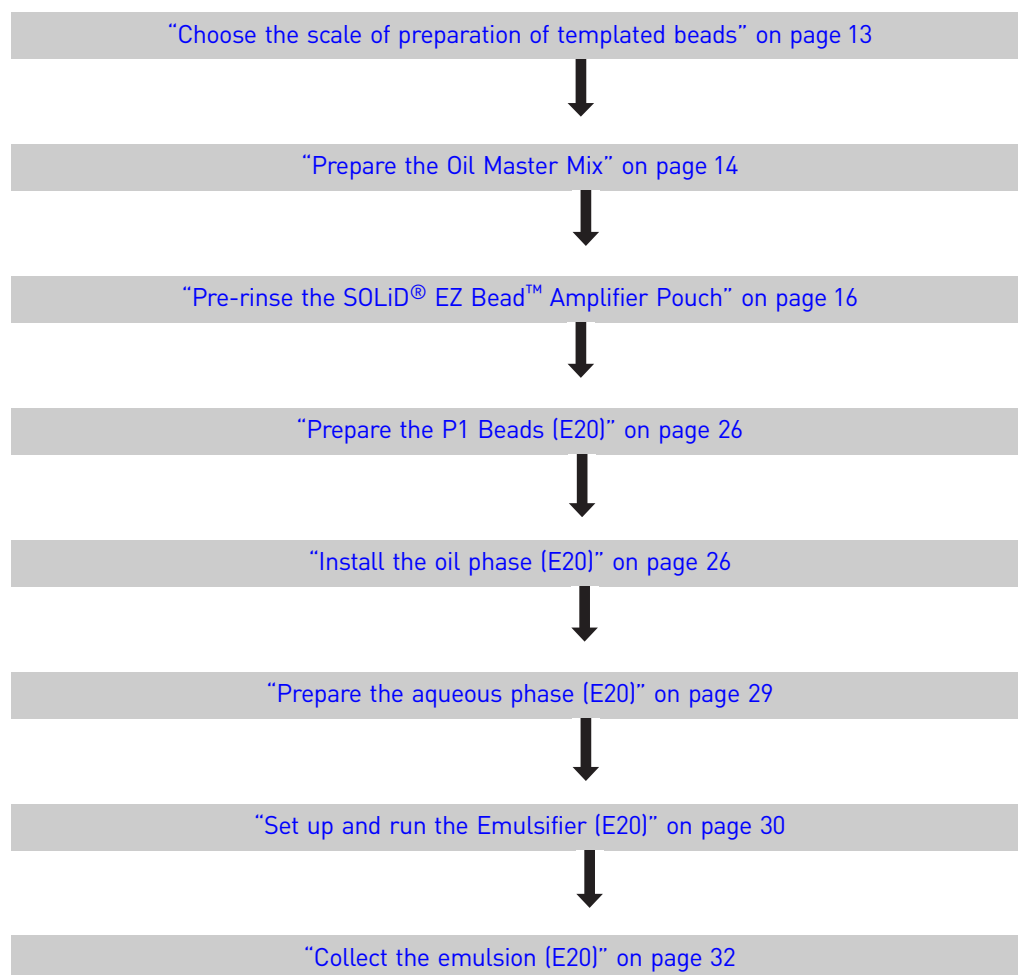




# 3

## Prepare and Run the Emulsifier (E20)

This chapter explains how to prepare and run the Emulsifier for the E20 scale:



## Prepare and run the Emulsifier (E20)

**Note:** You can thaw the Emulsifier reagents on ice as you prepare the P1 Beads and install the oil phase (see, [“Prepare the aqueous phase \(E20\)” on page 29](#)).

### Prepare the P1 Beads (E20)

1. If you are amplifying the library with the SOLiD EZ Bead Amplifier, then it is recommended to pre-rinse the pouches used with the Amplifier before emulsifying the library (see [“Pre-rinse the SOLiD® EZ Bead™ Amplifier Pouch” on page 16](#)).
2. Vortex and pulse-spin one tube of Emulsifier E20 – P1 Beads.
3. Ensure that the P1 Beads are completely resuspended, then pipet 330 µL of P1 Beads into a 1.5-mL DNA LoBind Tube.
4. Place the tube of beads in a magnetic rack for at least 1 minute. After the solution clears, remove and discard the supernatant.
5. Resuspend the beads in 330 µL Emulsifier E20 – BB Solution.
6. Sonicate the beads using the Bead Block Declump program on the Covaris® S2 System (for program conditions, see [“Bead Block Declump” on page 61](#)), then pulse-spin the tube.
7. Place the tube of beads in a magnetic rack for at least 1 minute. After the solution clears, remove and discard the supernatant.
8. Resuspend the beads in 330 µL of 1X TEX Buffer.
9. Store the beads at 4°C until ready for use.

### Install the oil phase (E20)

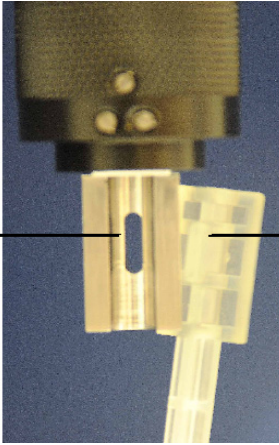
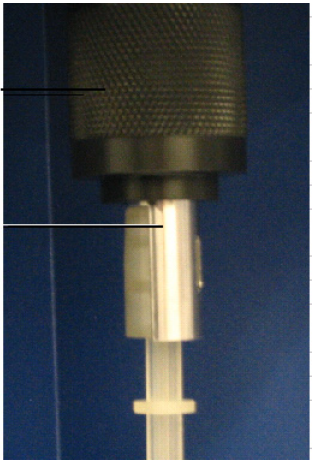
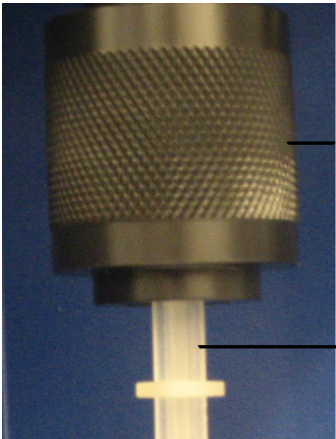
1. Unscrew and retain the cap with impeller of the Emulsifier E-Small Jar.
2. Tare the E-Small Jar on an analytical balance.
3. Pour 15.7 g of Oil Master Mix into the E-Small Jar (see [“Prepare the Oil Master Mix” on page 14](#)).
4. Screw the cap with the impeller on the jar.
5. Install the jar on the Emulsifier:
  - a. Turn the knob clockwise to open the compartment door.
  - b. Pull the arm back at the base towards the opening of the compartment.
  - c. Slide the jar into the groove of the base of the compartment until the jar stops against the back of the groove.
  - d. Allow the arm to rest against the jar (see [Figure 7](#)).
  - e. Rotate the jar so that the port on the cap is to the left of the impeller shaft.

**Figure 7** The jar rests on the back of the groove and the arm is against the jar



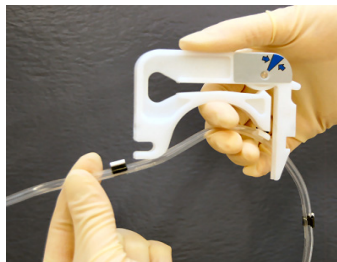
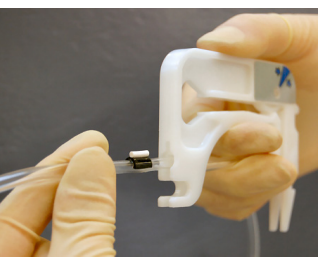

6. Fit the impeller head into the locking slot. Slide the coupler down until the coupler clicks to a stop to ensure that the impeller head is firmly in place in the coupler (see [Table 4](#)).

**Table 4** How to fit the impeller head into the locking slot

 <p>Locking slot</p> <p>Impeller head</p>	 <p>Coupler</p> <p>Impeller head</p>	 <p>Coupler</p> <p>Impeller</p>
<p>1. Align the locking slot with the impeller head.</p>	<p>2. Fit the impeller head into the groove below the coupler.</p>	<p>3. Slide the coupler over the impeller head.</p>

7. Attach the tubing with the Luer-Lok to the port of the cap.
8. Insert the 3-stop tubing with one stop in the pump cassette (see [Table 5](#)).

**Table 5** How to insert the tubing into the pump cassette

		
<p>1. Using your <i>right</i> hand, hold the pump cassette with your thumb and forefinger.</p> <p>2. Using your <i>left</i> hand, grasp the tubing with your thumb and forefinger above the black stop.</p>	<p>3. Pull the tubing slightly to slide the tubing into the pump cassette.</p> <p>4. Slide the tubing until the stop is aligned with the stop fixture on the outside edge of the pump cassette.</p>	<p>5. Pull the tubing slightly towards the inside of the pump cassette to fit the stop snugly into the fixture.</p>

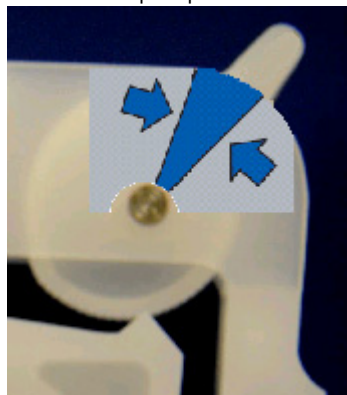
- a. Repeat step 8 to insert the tubing with the second stop at the other end of the pump cassette. Ensure that the tubing is in the inner groove opposite the second stop (see [Table 5](#)) and that the tubing is in the correct orientation (see [Figure 8](#)).
- b. Install the pump cassette into the roller-head of the pump (see [Figure 10](#) on [page 29](#)).

**Figure 8** Correct orientation of the Emulsifier Tubing



- c. Turn the pinch wheel in the pump cassette counter-clockwise so that the mark is in the blue zone (see [Figure 9](#) on [page 28](#)). This adjustment maintains correct tubing tension for normal pump operation.

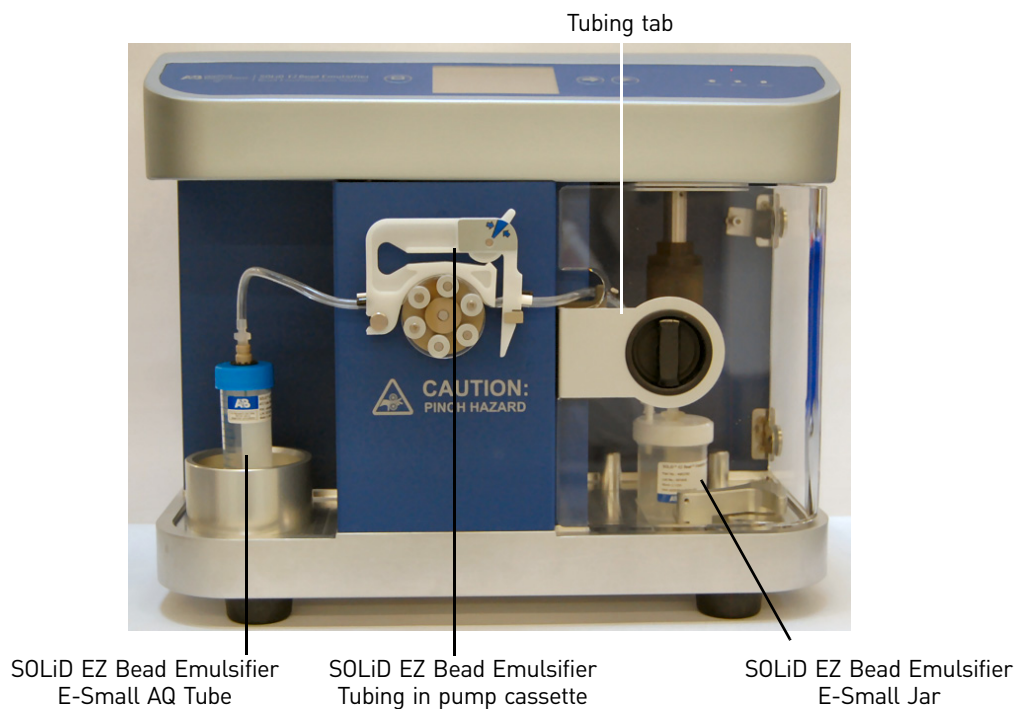
**Figure 9** Turn the pinch wheel in the pump cassette so that the mark is in the blue zone



9. Position the tubing so that it threads through the tubing tab (see [Figure 10](#)).

10. Close the door of the compartment, then turn the knob counter-clockwise to lock the door (see [Figure 10](#)).

**Figure 10** Placement of Emulsifier E-Small AQ Tube, Tubing, and E-Small Jar



## Prepare the aqueous phase (E20)

1. Thaw on ice:
  - Emulsifier E20 – P1 reagent, then vortex the reagent for a few seconds, and pulse-spin.
  - Emulsifier E20 – P2 reagent, then vortex the reagent for a few seconds, and pulse-spin.
  - Library template.

Place on ice:

Emulsifier E20 – Aqueous Master mix. Do *not* vortex

2. Place the Emulsifier E-Small AQ Tube on ice for filling.
3. Prepare a 1:10 dilution of P1 Reagent by adding 5  $\mu\text{L}$  of P1 reagent to 45  $\mu\text{L}$  of Low TE Buffer in a 1.5-mL DNA LoBind Tube.

4. Add the appropriate volume to the AQ Tube in this order:

E20 Reagent	Volume ( $\mu\text{L}$ )
Aqueous Master Mix	11060 - $X^{\dagger}$
1:10 diluted P1 Reagent	46
Undiluted P2 Reagent	69

E20 Reagent	Volume (μL)
Library template	X

† X = Volume of library template. Use a Pipet-Aid® pipette fitted with a 25-mL serological pipette to dispense Aqueous Master Mix into the E-Small AQ Tube.



5. Cap the AQ Tube and swirl to mix the solution. Place the AQ Tube back on ice.

## Set up and run the Emulsifier (E20)


1. Power on the Emulsifier.
2. Ensure that the Oil Master Mix in the Emulsifier Jar is at room temperature.
3. Vortex, then pulse-spin the tube of prepared P1 beads.
4. Sonicate the prepared P1 Beads using the Covalent Declump 1 program on the Covaris® S2 System (for program conditions, see “Covalent Declump 1” on page 61), then pulse-spin the tube.  
**IMPORTANT!** Perform steps 5 and 6 below as quickly as possible before the beads settle in the aqueous phase. If the beads settle before step 6, swirl the aqueous phase again, then perform step 6.
5. *Immediately* add the beads to the aqueous phase, then swirl the AQ Tube until the suspension is uniformly brown.
6. Immediately load the AQ Tube onto the Emulsifier, then attach the tubing to the cap of the AQ Tube (see Figure 10 on page 29). Ensure that the beads have not settled.



**CAUTION! PINCH HAZARD. Moving Parts. Moving parts can crush, pinch and cut. Keep hands clear of moving parts while operating the instrument. Disconnect power before servicing.**

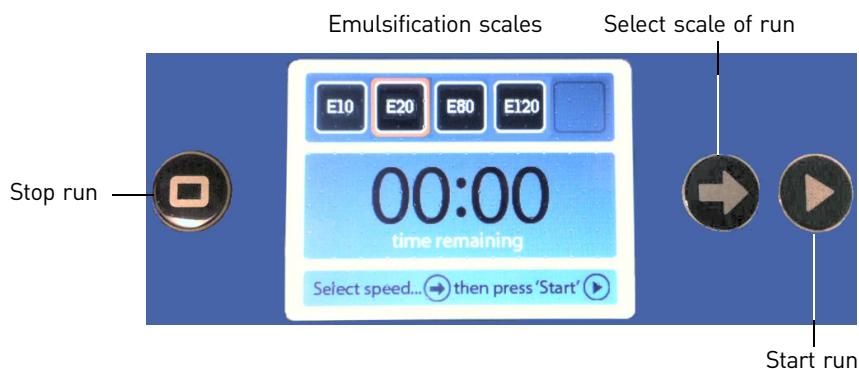
7. Start the run:
  - a. Press the scale-selection button  to select the E20 scale on the instrument key panel (see Figure 11 on page 31).
  - b. Press the start button . The motor starts and runs for ~10 seconds before the pump starts. The middle light on the panel is lit yellow.  
**IMPORTANT!** Do *not* open the door of the emulsifier while a run is in progress. Opening the door automatically aborts the run, and the emulsion is not properly prepared. If you open the door in error, set up and prepare the emulsion again (see “Prepare the P1 Beads (E20)” on page 26).

The run time is ~10 minutes. After the run is complete, the Emulsifier stops automatically, the right light on the panel is lit green, and the panel says, “Complete.”

**IMPORTANT!** To stop the run, press the stop button , then press the stop button *again* to confirm that you want to stop the run. The left light on the panel is lit red, and the panel says, “Run aborted.”

Stop the run only if the Emulsifier malfunctions. If you stop the run before the run is complete, then discard the emulsion because it is not properly prepared. Troubleshoot, if necessary (see [Appendix B, “Troubleshooting” on page 57](#)), then prepare and install the reagents again for the appropriate scale of emulsification.

Figure 11 How to use the Emulsifier



Light color	Meaning
Green	Run is complete
Yellow	Instrument is running
Red	Run aborted, failed run, or error



## Collect the emulsion (E20)

1. Ensure that the run is finished. When the run is finished, the clock says “00:00.”
2. Turn the knob clockwise to unlock the compartment door, then open the door.
3. Slide the coupler up and away from the impeller head.
4. Gently pull the impeller head from the coupler.
5. Swing out the arm at the base, then remove the impeller and the jar from the compartment.
6. Detach the tubing from the port on the cap of the jar.
7. Remove the pump cassette, tubing, and AQ Tube from the instrument as one unit.
8. To release the tubing from the pump cassette, turn the pinch wheel clockwise to the silver zone, then remove the tubing.
9. Discard the used AQ Tube and tubing. *Store the pump cassette on top of the Emulsifier.*  
**IMPORTANT!** The pump cassette is part of the instrument and is not disposable.
10. Close the door of the compartment, then turn the knob counter-clockwise to lock the door.
11. *Immediately* perform emulsion PCR (ePCR) on the emulsion using the SOLiD EZ Bead Amplifier [refer to the *Applied Biosystems SOLiD® EZ Bead™ Amplifier Getting Started Guide* (Part no. 4443494)].



# 4

## Prepare and Run the Emulsifier (E80)

This chapter explains how to prepare and run the Emulsifier for the E80 scale:



## Prepare and run the Emulsifier (E80)

**Note:** You can thaw the Emulsifier reagents on ice as you prepare the P1 Beads and install the oil phase (see , [“Prepare the aqueous phase \(E80\)” on page 37](#)).

### Prepare the P1 Beads (E80)

1. If you are amplifying the library with the SOLiD EZ Bead Amplifier, then it is recommended to pre-rinse the pouches used with the Amplifier before emulsifying the library (see [“Pre-rinse the SOLiD® EZ Bead™ Amplifier Pouch” on page 16](#)).
2. Vortex and pulse-spin one tube of Emulsifier E80 – P1 Beads.
3. Ensure that the P1 Beads are completely resuspended, then pipet 1430 µL of P1 Beads into a 2.0-mL DNA LoBind Tube.
4. Place the tube of beads in a magnetic rack for at least 1 minute. After the solution clears, remove and discard the supernatant.
5. Resuspend the beads in 1430 µL Emulsifier E80 – BB Solution.
6. Sonicate the beads using the Bead Block Declump program on the Covaris® S2 System (for program conditions, see [“Bead Block Declump” on page 61](#)), then pulse-spin the tube.
7. Place the tube of beads in a magnetic rack for at least 1 minute. After the solution clears, remove and discard the supernatant.
8. Resuspend the beads in 1430 µL of 1X TEX Buffer.
9. Store the beads at 4°C until ready for use.

### Install the oil phase (E80)

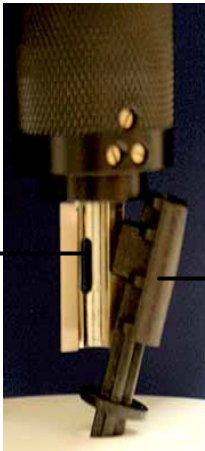


1. Unscrew and retain the cap with impeller of the Emulsifier E-Large Jar.
2. Tare the E-Large Jar on an analytical balance.
3. Pour 67.9 g of Oil Master Mix into the E-Large Jar (see [“Prepare the Oil Master Mix” on page 14](#)).
4. Screw the cap with the impeller on the jar.
5. Install the jar on the Emulsifier:
  - a. Turn the knob clockwise to open the compartment door.
  - b. Pull the arm back at the base towards the opening of the compartment.
  - c. Slide the jar until it stops against the two posts at the rear of the compartment.
  - d. Allow the arm to rest against the jar (see [Figure 12](#)).
  - e. Rotate the jar so that the port on the cap is to the left of the impeller shaft.

Figure 12 Rest the arm against the jar



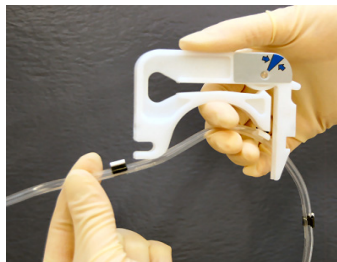
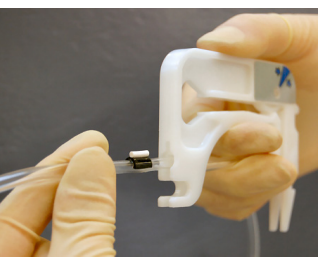

6. Fit the impeller head into the locking slot. Slide the coupler down until the coupler clicks to a stop to ensure that the impeller head is firmly in place in the coupler (see Table 6).

Table 6 How to fit the impeller head into the locking slot

		
1. Align the locking slot with the impeller head.	2. Fit the impeller head into the groove below the coupler.	3. Slide the coupler over the impeller head.

7. Attach the tubing with the Luer-Lok to the port of the cap.
8. Insert the 3-stop tubing with one stop in the pump cassette (see Table 7 on page 36).

**Table 7** How to insert the tubing into the pump cassette

		
<p>1. Using your <i>right</i> hand, hold the pump cassette with your thumb and forefinger.</p> <p>2. Using your <i>left</i> hand, grasp the tubing with your thumb and forefinger above the black stop.</p>	<p>3. Pull the tubing slightly to slide the tubing into the pump cassette.</p> <p>4. Slide the tubing until the stop is aligned with the stop fixture on the outside edge of the pump cassette.</p>	<p>5. Pull the tubing slightly towards the inside of the pump cassette to fit the stop snugly into the fixture.</p>

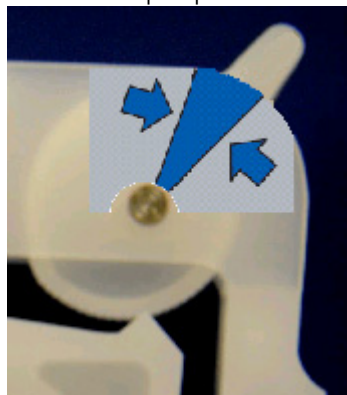
- a. Repeat step 8 to insert the tubing with the second stop at the other end of the pump cassette. Ensure that the tubing is in the inner groove opposite the second stop (see [Table 7](#)) and that the tubing is in the correct orientation (see [Figure 13](#)).

**Figure 13** Correct orientation of the Emulsifier Tubing



- b. Install the pump cassette into the roller-head of the pump (see [Figure 15 on page 37](#)).
- c. Turn the pinch wheel in the pump cassette counter-clockwise so that the mark is in the blue zone (see [Figure 14](#)). This adjustment maintains correct tubing tension for normal pump operation.

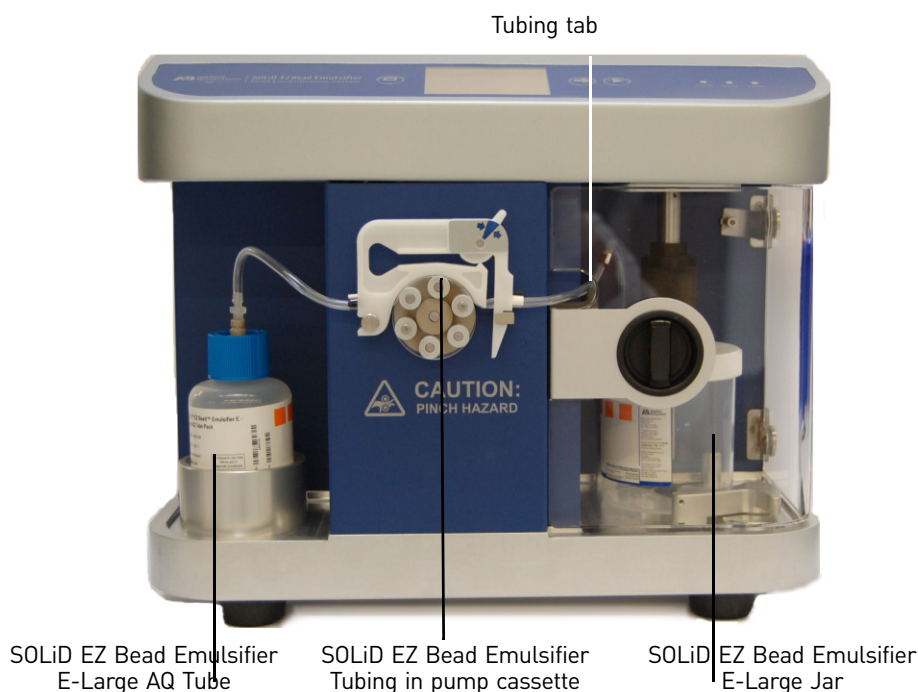
**Figure 14** Turn the pinch wheel in the pump cassette so that the mark is in the blue zone



9. Position the tubing so that it threads through the tubing tab (see [Figure 15](#)).

10. Close the door of the compartment, then turn the knob counter-clockwise to lock the door (see [Figure 15](#)).

**Figure 15** Placement of Emulsifier E-Large AQ Tube, Tubing, and E-Large Jar



### Prepare the aqueous phase (E80)

1. Thaw on ice:
  - Emulsifier E80 – P1 reagent, then vortex the reagent for a few seconds, and pulse-spin.
  - Emulsifier E80 – P2 reagent, then vortex the reagent for a few seconds, and pulse-spin.
  - Library template.

Place on ice:

Emulsifier E80 – Aqueous Master mix. Do *not* vortex

2. Place the Emulsifier E-Large AQ Tube on ice for filling.
3. Prepare a 1:10 dilution of P1 Reagent by adding 21  $\mu$ L of P1 reagent to 189  $\mu$ L of Low TE Buffer in a 1.5-mL DNA LoBind Tube.
4. Add the appropriate volume to the AQ Tube in this order:

E80 Reagent	Volume ( $\mu$ L)
Aqueous Master Mix	48000 - X <sup>†</sup>
1:10 diluted P1 Reagent	200
Undiluted P2 Reagent	300
Library template	X

<sup>†</sup> X = Volume of library template. Use a Pipet-Aid<sup>®</sup> pipette fitted with a 50-mL serological pipette to dispense Aqueous Master Mix into the E-Large AQ Tube.

## Set up and run the Emulsifier (E80)

5. Cap the AQ Tube and swirl to mix the solution. Place the AQ Tube back on ice.

1. Power on the Emulsifier.
2. Ensure that the Oil Master Mix in the Emulsifier Jar is at room temperature.
3. Vortex, then pulse-spin the tube of prepared P1 beads.
4. Sonicate the prepared P1 Beads using the Covalent Declump 3 program on the Covaris® S2 System (for program conditions, see [“Covalent Declump 3” on page 61](#)), then pulse-spin the tube.


**IMPORTANT!** Perform steps 5 and 6 below as quickly as possible before the beads settle in the aqueous phase. If the beads settle before step 6, swirl the aqueous phase again, then perform step 6.

5. *Immediately* add the beads to the aqueous phase, then swirl the AQ Tube until the suspension is uniformly brown.
6. Immediately load the AQ Tube onto the Emulsifier, then attach the tubing to the cap of the AQ Tube (see [Figure 15 on page 37](#)). Ensure that the beads have not settled.




**CAUTION! PINCH HAZARD. Moving Parts. Moving parts can crush, pinch and cut. Keep hands clear of moving parts while operating the instrument. Disconnect power before servicing.**

7. Start the run:
  - a. Press the scale-selection button  to select the E80 scale on the instrument key panel (see [Figure 16 on page 39](#)).

- b. Press the start button . The motor starts and runs for ~10 seconds before the pump starts. The middle light on the panel is lit yellow.

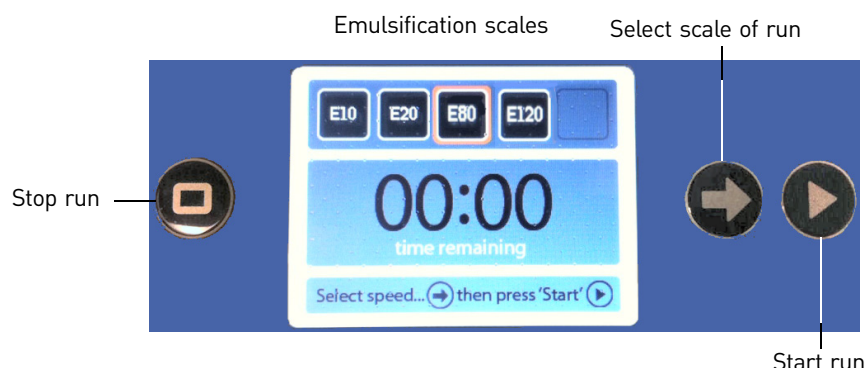
**IMPORTANT!** Do *not* open the door of the emulsifier while a run is in progress. Opening the door automatically aborts the run, and the emulsion is not properly prepared. If you open the door in error, set up and prepare the emulsion again (see [“Prepare the P1 Beads \(E80\)” on page 34](#)).

The run time is ~15 minutes. After the run is complete, the SOLiD EZ Bead Emulsifier stops automatically, the right light on the panel is lit green, and the panel says, “Complete.”

**IMPORTANT!** To stop the run, press the stop button , then press the stop button *again* to confirm that you want to stop the run. The left light on the panel is lit red, and the panel says, “Run aborted.”

Stop the run only if the SOLiD EZ Bead Emulsifier malfunctions. If you stop the run before the run is complete, then discard the emulsion because it is not properly prepared. Troubleshoot, if necessary (see [Appendix B, “Troubleshooting” on page 57](#)), then prepare and install the reagents again for the appropriate scale of emulsification.

Figure 16 How to use the Emulsifier



Light color	Meaning
Green	Run is complete
Yellow	Instrument is running
Red	Run aborted, failed run, or error

## Collect the emulsion (E80)

1. Ensure that the run is finished. When the run is finished, the clock says "00:00."
  2. Turn the knob clockwise to unlock the compartment door, then open the door.
  3. Slide the coupler up and away from the impeller head.
  4. Gently pull the impeller head from the coupler.
  5. Swing out the arm at the base, then remove the impeller and the jar from the compartment.
  6. Detach the tubing from the port on the cap of the jar.
  7. Remove the pump cassette, tubing, and AQ Tube from the instrument as one unit.
  8. To release the tubing from the pump cassette, turn the pinch wheel clockwise to the silver zone, then remove the tubing.
  9. Discard the used AQ Tube and tubing. *Store the pump cassette on top of the Emulsifier.*
- IMPORTANT!** The pump cassette is part of the instrument and is not disposable.
10. Close the door of the compartment, then turn the knob counter-clockwise to lock the door.
  11. *Immediately* perform emulsion PCR (ePCR) on the emulsion using the SOLiD EZ Bead Amplifier [refer to the *Applied Biosystems SOLiD® EZ Bead™ Amplifier Getting Started Guide* (Part no. 4443494)].

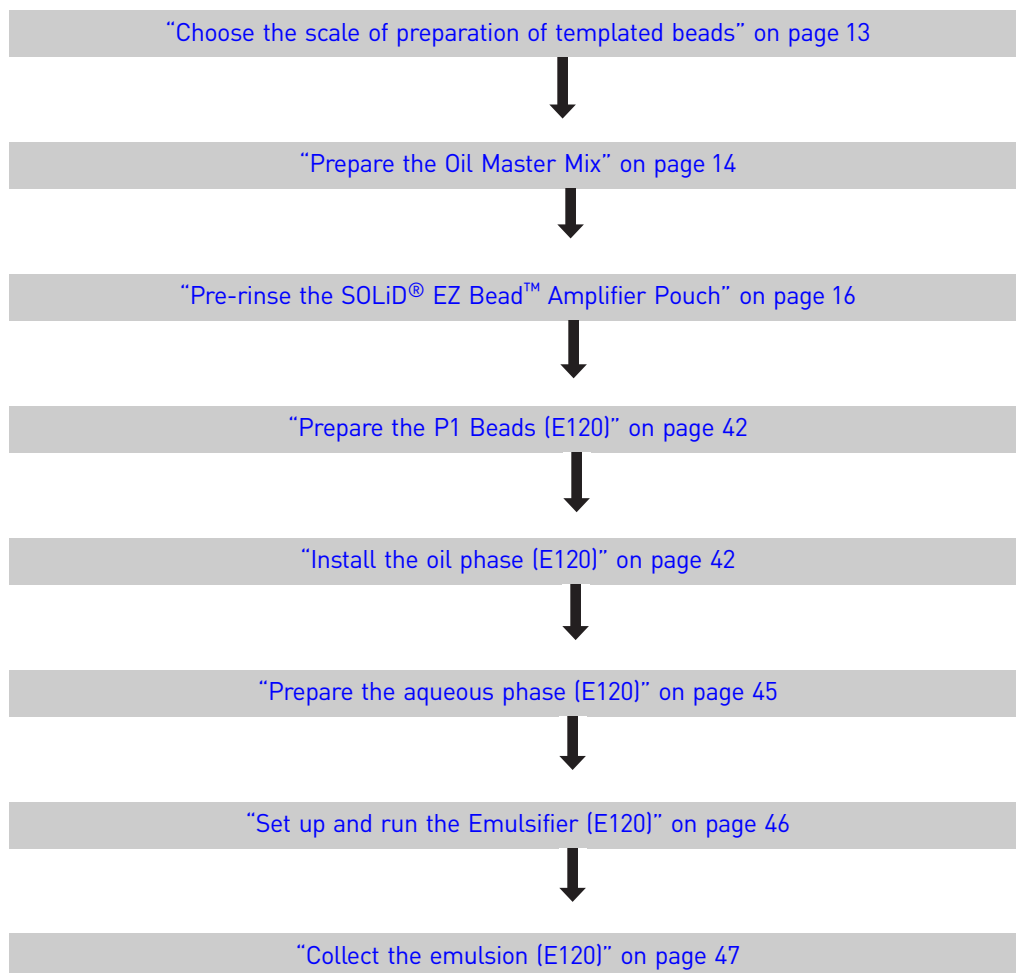




# 5

## Prepare and Run the Emulsifier (E120)

This chapter explains how to prepare and run the Emulsifier for the E120 scale:



## Prepare and run the Emulsifier (E120)

**Note:** You can thaw the Emulsifier reagents on ice as you prepare the P1 Beads and install the oil phase (see , [“Prepare the aqueous phase \(E120\)” on page 45](#)).

### Prepare the P1 Beads (E120)

1. If you are amplifying the library with the SOLiD® EZ Bead™ Amplifier, then we recommend pre-rinsing the pouches used with the Amplifier before emulsifying the library (see [“Pre-rinse the SOLiD® EZ Bead™ Amplifier Pouch” on page 16](#)).
2. Vortex and pulse-spin one tube of Emulsifier E120 – P1 Beads.
3. Ensure that the P1 Beads are completely resuspended, then pipet 1430 µL of P1 Beads into each of **TWO** 2.0-mL DNA LoBind Tubes for a total of 2860 µL of P1 Beads.
4. Place both tubes of beads in a magnetic rack for at least 1 minute. After the solution clears, remove and discard the supernatant.
5. Resuspend **EACH** tube of beads in 1430 µL Emulsifier E120 – BB Solution.
6. Sonicate **EACH** tube of beads using the Bead Block Declump program on the Covaris™ S2 System (for program conditions, see [“Bead Block Declump” on page 61](#)), then pulse-spin the tubes.
7. Place **BOTH** tubes of beads in a magnetic rack for at least 1 minute. After the solution clears, remove and discard the supernatant.
8. Resuspend the beads in **EACH** tube in 715 µL of 1X TEX Buffer.
9. Combine the two tubes of beads into one tube. Use 300 µL of 1X TEX Buffer to rinse out any remaining beads in the empty tube, then add them into the first tube. Discard the empty tube.
10. Place the tube of beads in a magnetic rack for at least 1 minute. After the solution clears, remove and discard the supernatant.
11. Resuspend the beads in 1430 µL of 1X TEX Buffer.
12. Store the beads at 4°C until they are ready for use.

### Install the oil phase (E120)

1. Unscrew and retain the cap with impeller of the Emulsifier E-Large Jar.
2. Tare the E-Large Jar on an analytical balance.
3. Pour 67.9 g of Oil Master Mix into the E-Large Jar (see [“Prepare the Oil Master Mix” on page 14](#)).
4. Screw the cap with the impeller on the jar.
5. Install the jar on the Emulsifier:
  - a. Turn the knob clockwise to open the compartment door.
  - b. Pull the arm back at the base towards the opening of the compartment.
  - c. Slide the jar until it stops against the two posts at the rear of the compartment.
  - d. Allow the arm to rest against the jar (see [Figure 17](#)).

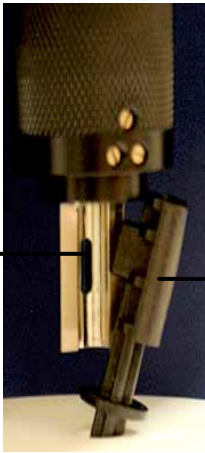


- e. Rotate the jar so that the port on the cap is to the left of the impeller shaft.

Figure 17 Rest the arm against the jar



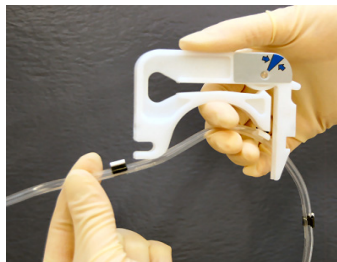
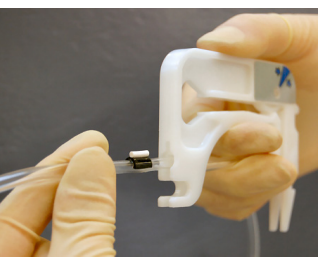

- 6. Fit the impeller head into the locking slot. Slide the coupler down until the coupler clicks to a stop to ensure that the impeller head is firmly in place in the coupler (see Table 8).

Table 8 How to fit the impeller head into the locking slot

		
1. Align the locking slot with the impeller head.	2. Fit the impeller head into the groove below the coupler.	3. Slide the coupler over the impeller head.

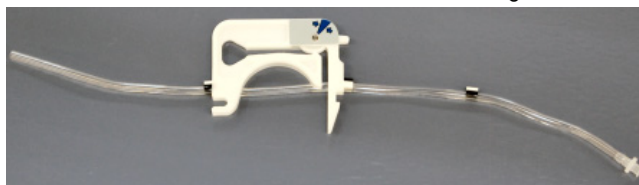
- 7. Attach the tubing with the Luer-Lok to the port of the cap.
- 8. Insert the 3-stop tubing with one stop in the pump cassette (see Table 9 on page 44).

**Table 9** How to insert the tubing into the pump cassette

		
<p>1. Using your <i>right</i> hand, hold the pump cassette with your thumb and forefinger.</p> <p>2. Using your <i>left</i> hand, grasp the tubing with your thumb and forefinger above the black stop.</p>	<p>3. Pull the tubing slightly to slide the tubing into the pump cassette.</p> <p>4. Slide the tubing until the stop is aligned with the stop fixture on the outside edge of the pump cassette.</p>	<p>5. Pull the tubing slightly towards the inside of the pump cassette to fit the stop snugly into the fixture.</p>

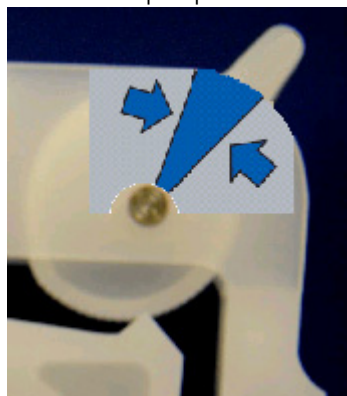
- a. Repeat step 8 to insert the tubing with the second stop at the other end of the pump cassette. Ensure that the tubing is in the inner groove opposite the second stop (see [Table 9](#)) and that the tubing is in the correct orientation (see [Figure 18](#)).

**Figure 18** Correct orientation of the Emulsifier Tubing



- b. Install the pump cassette into the roller-head of the pump (see [Figure 20 on page 45](#)).
- c. Turn the pinch wheel in the pump cassette counter-clockwise so that the mark is in the blue zone (see [Figure 19](#)). This adjustment maintains correct tubing tension for normal pump operation.

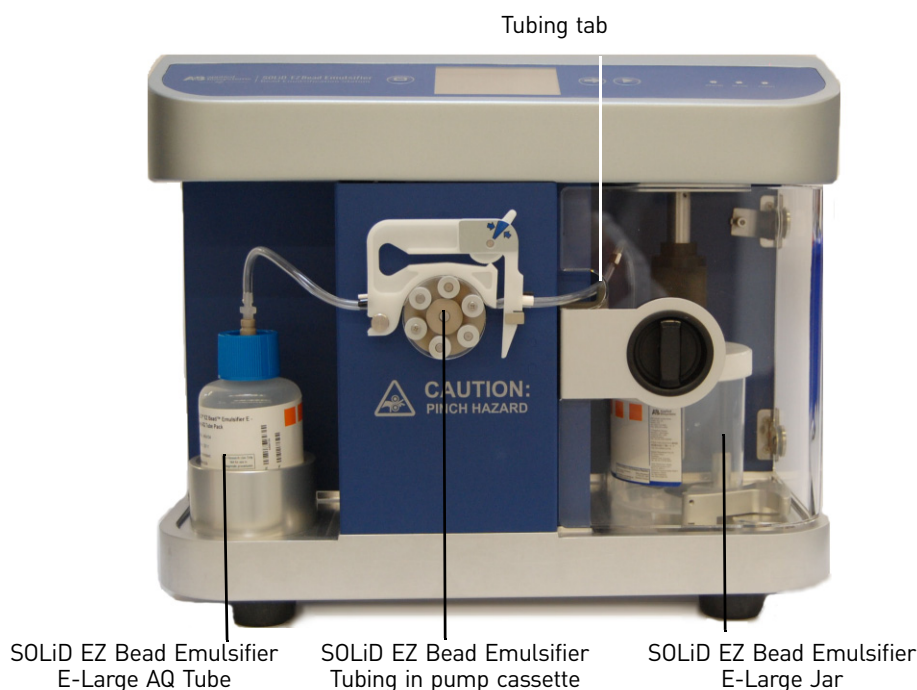
**Figure 19** Turn the pinch wheel in the pump cassette so that the mark is in the blue zone



9. Position the tubing so that it threads through the tubing tab (see [Figure 20](#)).

10. Close the door of the compartment, then turn the knob counter-clockwise to lock the door (see Figure 20).

**Figure 20** Placement of Emulsifier E-Large AQ Tube, Tubing, and E-Large Jar



## Prepare the aqueous phase (E120)

1. Thaw on ice:
  - Emulsifier E120 – P1 reagent, then vortex the reagent for a few seconds, and pulse-spin.
  - Emulsifier E120 – P2 reagent, then vortex the reagent for a few seconds, and pulse-spin.
  - Library template.

Place on ice:

Emulsifier E120 – Aqueous Master mix. Do *not* vortex.

2. Place the Emulsifier E-Large AQ Tube on ice for filling.
3. Prepare a 1:10 dilution of P1 Reagent by adding 21  $\mu$ L of P1 reagent to 189  $\mu$ L of Low TE Buffer in a 1.5-mL DNA LoBind Tube.
4. Add the appropriate volume to the AQ Tube in this order:

E120 Reagent	Volume ( $\mu$ L)
Aqueous Master Mix	48000 - $X^{\dagger}$
1:10 diluted P1 Reagent	200
Undiluted P2 Reagent	300
Library template	$X$

$\dagger$   $X$  = Volume of library template. Use a Pipet-Aid<sup>®</sup> pipette fitted with a 50-mL serological pipette to dispense Aqueous Master Mix into the E-Large AQ Tube.

## Set up and run the Emulsifier (E120)

5. Cap the AQ Tube and swirl to mix the solution. Place the AQ Tube back on ice.



1. Power on the Emulsifier.
2. Ensure that the Oil Master Mix in the Emulsifier Jar is at room temperature.
3. Vortex, then pulse-spin the tube of prepared P1 beads.
4. Sonication of P1 beads:
  - a. Sonicate the prepared P1 Beads *two times*, using the Covalent Declump 3 program on the Covaris S2 System (for program conditions, see [“Covalent Declump 3” on page 61](#)).
  - b. Pulse-spin the tube.

**IMPORTANT!** Perform steps 5 and 6 below as quickly as possible before the beads settle in the aqueous phase. If the beads settle before step 6, swirl the aqueous phase again, then perform step 6.

5. *Immediately* add the beads to the aqueous phase, then swirl the AQ Tube until the suspension is uniformly brown.
6. Immediately load the AQ Tube onto the Emulsifier, then attach the tubing to the cap of the AQ Tube (see [Figure 20 on page 45](#)). Ensure that the beads have not settled.




**CAUTION! PINCH HAZARD. Moving Parts. Moving parts can crush, pinch and cut. Keep hands clear of moving parts while operating the instrument. Disconnect power before servicing.**

7. Start the run:
  - a. Press the scale-selection button  to select the E120 scale on the instrument key panel (see [Figure 21 on page 47](#)).
  - b. Press the start button . The motor starts and runs for ~10 seconds before the pump starts. The middle light on the panel is lit yellow.

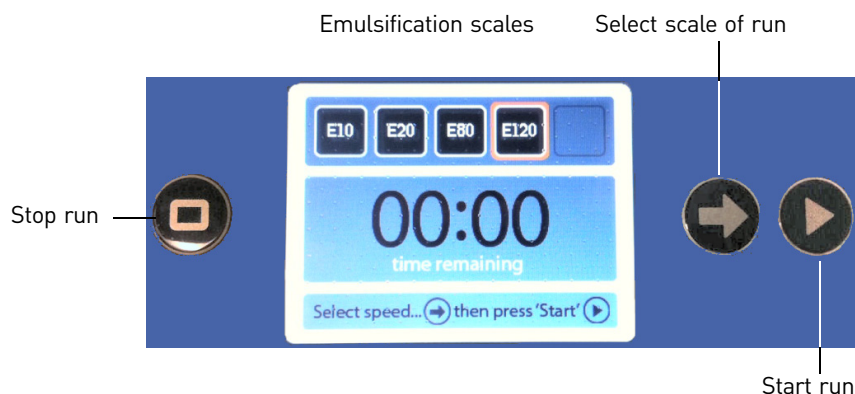
**IMPORTANT!** Do *not* open the door of the emulsifier while a run is in progress. Opening the door automatically aborts the run, and the emulsion is not properly prepared. If you open the door in error, set up and prepare the emulsion again (see [“Prepare the P1 Beads \(E120\)” on page 42](#)).

The run time is ~15 minutes. After the run is complete, the SOLiD EZ Bead Emulsifier stops automatically, the right light on the panel is lit green, and the panel says, “Complete.”

**IMPORTANT!** To stop the run, press the stop button , then press the stop button *again* to confirm that you want to stop the run. The left light on the panel is lit red, and the panel says, “Run aborted.”

Stop the run only if the SOLiD EZ Bead Emulsifier malfunctions. If you stop the run before the run is complete, then discard the emulsion because it is not properly prepared. Troubleshoot, if necessary (see [Appendix B, “Troubleshooting” on page 57](#)), then prepare and install the reagents again for the appropriate scale of emulsification.

Figure 21 How to use the Emulsifier



Light color	Meaning
Green	Run is complete
Yellow	Instrument is running
Red	Run aborted, failed run, or error

## Collect the emulsion (E120)

1. Ensure that the run is finished. When the run is finished, the clock reads "00:00."
  2. Turn the knob clockwise to unlock the compartment door, then open the door.
  3. Slide the coupler up and away from the impeller head.
  4. Gently pull the impeller head from the coupler.
  5. Swing out the arm at the base, then remove the impeller and the jar from the compartment.
  6. Detach the tubing from the port on the cap of the jar.
  7. Remove the pump cassette, tubing, and AQ Tube from the instrument as one unit.
  8. To release the tubing from the pump cassette, turn the pinch wheel clockwise to the silver zone, then remove the tubing.
  9. Discard the used AQ Tube and tubing. *Store the pump cassette on top of the Emulsifier.*
- IMPORTANT!** The pump cassette is part of the instrument and is not disposable.
10. Close the door of the compartment, then turn the knob counter-clockwise to lock the door.
  11. *Immediately* perform emulsion PCR (ePCR) on the emulsion using the SOLiD EZ Bead Amplifier [refer to the *Applied Biosystems SOLiD® EZ Bead™ Amplifier Getting Started Guide* (Part no. 4443494)].







# Ordering Information

Order one or more of the kits according to the scale of emulsion preparation.

## Required kits (E10)

### Required Applied Biosystems kits (E10)

Item (part number) <sup>†</sup>	Components
Applied Biosystems SOLiD® EZ Bead™ Emulsifier E10 Reagent Kit (4452720)	Box 1: <ul style="list-style-type: none"><li>• SOLiD EZ Bead Emulsifier E10 – Aqueous Master Mix</li><li>• SOLiD EZ Bead Emulsifier E10 – P1 Beads</li></ul> Box 2: <ul style="list-style-type: none"><li>• SOLiD EZ Bead Emulsifier E10 – P1 Reagent</li><li>• SOLiD EZ Bead Emulsifier E10 – P2 Reagent</li><li>• SOLiD EZ Bead Emulsifier E10 – BB Solution</li></ul> Box 3: <ul style="list-style-type: none"><li>• SOLiD EZ Bead Emulsifier Reagent – 1X TEX Buffer</li><li>• SOLiD EZ Bead Emulsifier Reagent – 1X Low TE Buffer</li></ul>
SOLiD® EZ Bead™ Emulsifier Oil Pack Kit (4457185)	SOLiD EZ Bead Emulsifier Oil Kit: <ul style="list-style-type: none"><li>• SOLiD EZ Bead Emulsifier Oil Kit – Stabilizer 1</li><li>• SOLiD EZ Bead Emulsifier Oil Kit – Stabilizer 2</li><li>• SOLiD EZ Bead Emulsifier Oil Kit – Oil</li></ul> SOLiD EZ Bead Emulsifier Oil Accessory Kit: <ul style="list-style-type: none"><li>• SOLiD EZ Bead Emulsifier Oil Kit– Oil Mix Bottle</li><li>• SOLiD EZ Bead Emulsifier Oil Kit– Oil Funnel</li></ul>
SOLiD® EZ Bead™ Emulsifier E10 Accessories Kit (4453065)	SOLiD EZ Bead Emulsifier E-Small Jar Pack SOLiD EZ Bead Emulsifier E-Small AQ Tube Pack SOLiD EZ Bead Emulsifier Tubing Pack
SOLiD® EZ Bead™ E10 System Consumables, 4-pack (4453093) <sup>‡</sup>	SOLiD EZ Bead Emulsifier E10 Reagent Kit SOLiD EZ Bead Emulsifier E10 Accessories Kit SOLiD EZ Bead Amplifier E10 Accessories Kit SOLiD EZ Bead Enricher E10 Reagent Kit SOLiD EZ Bead Enricher Buffer Kit SOLiD EZ Bead Enricher Accessories Kit

<sup>†</sup> Applied Biosystems has validated this protocol using this specific material. Substitution may adversely affect system performance.

‡ The kit includes consumables for all three instruments of the SOLiD EZ Bead System: the Enricher, Amplifier, and Emulsifier.

## Required kits (E20)

**Required Applied Biosystems kits (E20)**

Item (part number) <sup>†</sup>	Components
Applied Biosystems SOLiD® EZ Bead™ Emulsifier E20 Reagent Kit (4452721)	<p>Box 1:</p> <ul style="list-style-type: none"> <li>SOLiD EZ Bead Emulsifier E20 – Aqueous Master Mix</li> <li>SOLiD EZ Bead Emulsifier E20 – P1 Beads</li> </ul> <p>Box 2:</p> <ul style="list-style-type: none"> <li>SOLiD EZ Bead Emulsifier E20 – P1 Reagent</li> <li>SOLiD EZ Bead Emulsifier E20 – P2 Reagent</li> <li>SOLiD EZ Bead Emulsifier E20 – BB Solution</li> </ul> <p>Box 3:</p> <ul style="list-style-type: none"> <li>SOLiD EZ Bead Emulsifier Reagent – 1X TEX Buffer</li> <li>SOLiD EZ Bead Emulsifier Reagent – 1X Low TE Buffer</li> </ul>
SOLiD® EZ Bead™ Emulsifier Oil Pack Kit (4457185)	<p>SOLiD EZ Bead Emulsifier Oil Kit:</p> <ul style="list-style-type: none"> <li>SOLiD EZ Bead Emulsifier Oil Kit – Stabilizer 1</li> <li>SOLiD EZ Bead Emulsifier Oil Kit – Stabilizer 2</li> <li>SOLiD EZ Bead Emulsifier Oil Kit – Oil</li> </ul> <p>SOLiD EZ Bead Emulsifier Oil Accessory Kit:</p> <ul style="list-style-type: none"> <li>SOLiD EZ Bead Emulsifier Oil Kit– Oil Mix Bottle</li> <li>SOLiD EZ Bead Emulsifier Oil Kit– Oil Funnel</li> </ul>
SOLiD® EZ Bead™ Emulsifier E20 Accessories Kit (4453076)	<p>SOLiD EZ Bead Emulsifier E-Small Jar Pack</p> <p>SOLiD EZ Bead Emulsifier E-Small AQ Tube Pack</p> <p>SOLiD EZ Bead Emulsifier Tubing Pack</p>
SOLiD® EZ Bead™ E20 System Consumables, 4-pack (4453094) <sup>‡</sup>	<p>SOLiD EZ Bead Emulsifier E20 Reagent Kit</p> <p>SOLiD EZ Bead Emulsifier E20 Accessories Kit</p> <p>SOLiD EZ Bead Amplifier E20 Accessories Kit</p> <p>SOLiD EZ Bead Enricher E20 Reagent Kit</p> <p>SOLiD EZ Bead Enricher Buffer Kit</p> <p>SOLiD EZ Bead Enricher Accessories Kit</p>

<sup>†</sup> Applied Biosystems has validated this protocol using this specific material. Substitution may adversely affect system performance.

<sup>‡</sup> The kit includes consumables for all three instruments of the SOLiD EZ Bead System: the Enricher, Amplifier, and Emulsifier.

## Required kits (E80)

### Required Applied Biosystems kits (E80)

Item (part number) <sup>†</sup>	Components
Applied Biosystems SOLiD® EZ Bead™ Emulsifier E80 Reagent Kit (4452722)	<p>Box 1:</p> <ul style="list-style-type: none"> <li>SOLiD EZ Bead Emulsifier E80 – Aqueous Master Mix</li> <li>SOLiD EZ Bead Emulsifier E80 – P1 Beads</li> </ul> <p>Box 2:</p> <ul style="list-style-type: none"> <li>SOLiD EZ Bead Emulsifier E80 – P1 Reagent</li> <li>SOLiD EZ Bead Emulsifier E80 – P2 Reagent</li> <li>SOLiD EZ Bead Emulsifier E80 – BB Solution</li> </ul> <p>Box 3:</p> <ul style="list-style-type: none"> <li>SOLiD EZ Bead Emulsifier Reagent – 1X TEX Buffer</li> <li>SOLiD EZ Bead Emulsifier Reagent – 1X Low TE Buffer</li> </ul>
SOLiD® EZ Bead™ Emulsifier Oil Pack Kit (4457185)	<p>SOLiD EZ Bead Emulsifier Oil Kit:</p> <ul style="list-style-type: none"> <li>SOLiD EZ Bead Emulsifier Oil Kit – Stabilizer 1</li> <li>SOLiD EZ Bead Emulsifier Oil Kit – Stabilizer 2</li> <li>SOLiD EZ Bead Emulsifier Oil Kit – Oil</li> </ul> <p>SOLiD EZ Bead Emulsifier Oil Accessory Kit:</p> <ul style="list-style-type: none"> <li>SOLiD EZ Bead Emulsifier Oil Kit– Oil Mix Bottle</li> <li>SOLiD EZ Bead Emulsifier Oil Kit– Oil Funnel</li> </ul>
SOLiD® EZ Bead™ Emulsifier E80 Accessories Kit (4453070)	<p>SOLiD EZ Bead Emulsifier E-Large Jar Pack</p> <p>SOLiD EZ Bead Emulsifier E-Large AQ Tube Pack</p> <p>SOLiD EZ Bead Emulsifier Tubing Pack</p>
SOLiD® EZ Bead™ E80 System Consumables, 4-pack (4453095) <sup>‡</sup>	<p>SOLiD EZ Bead Emulsifier E80 Reagent Kit</p> <p>SOLiD EZ Bead Emulsifier E80 Accessories Kit</p> <p>SOLiD EZ Bead Amplifier E80 Accessories Kit</p> <p>SOLiD EZ Bead Enricher E80 Reagent Kit</p> <p>SOLiD EZ Bead Enricher Buffer Kit</p> <p>SOLiD EZ Bead Enricher Accessories Kit</p>

<sup>†</sup> Applied Biosystems has validated this protocol using this specific material. Substitution may adversely affect system performance.

<sup>‡</sup> The kit includes consumables for all three instruments of the SOLiD EZ Bead System: the Emulsifier, Amplifier, and Enricher.

## Required kits (E120)

### Required Applied Biosystems kits (E120)

Item (part number) <sup>†</sup>	Components
Applied Biosystems SOLiD® EZ Bead™ Emulsifier E120 Reagent Kit (4465555)	Box 1: <ul style="list-style-type: none"> <li>• SOLiD EZ Bead Emulsifier E120 – Aqueous Master Mix</li> <li>• SOLiD EZ Bead Emulsifier E120 – P1 Beads</li> </ul> Box 2: <ul style="list-style-type: none"> <li>• SOLiD EZ Bead Emulsifier E120 – P1 Reagent</li> <li>• SOLiD EZ Bead Emulsifier E120 – P2 Reagent</li> <li>• SOLiD EZ Bead Emulsifier E120 – BB Solution</li> </ul> Box 3: <ul style="list-style-type: none"> <li>• SOLiD EZ Bead Emulsifier Reagent – 1X TEX Buffer</li> <li>• SOLiD EZ Bead Emulsifier Reagent – 1X Low TE Buffer</li> </ul>
SOLiD® EZ Bead™ Emulsifier Oil Pack Kit (4457185)	SOLiD EZ Bead Emulsifier Oil Kit: <ul style="list-style-type: none"> <li>• SOLiD EZ Bead Emulsifier Oil Kit – Stabilizer 1</li> <li>• SOLiD EZ Bead Emulsifier Oil Kit – Stabilizer 2</li> <li>• SOLiD EZ Bead Emulsifier Oil Kit – Oil</li> </ul> SOLiD EZ Bead Emulsifier Oil Accessory Kit: <ul style="list-style-type: none"> <li>• SOLiD EZ Bead Emulsifier Oil Kit– Oil Mix Bottle</li> <li>• SOLiD EZ Bead Emulsifier Oil Kit– Oil Funnel</li> </ul>
SOLiD® EZ Bead™ Emulsifier E120 Accessories Kit (4465569)	SOLiD EZ Bead Emulsifier E-Large Jar Pack SOLiD EZ Bead Emulsifier E-Large AQ Tube Pack SOLiD EZ Bead Emulsifier Tubing Pack
SOLiD® EZ Bead™ E120 System Consumables, 4-pack (4465571) <sup>‡</sup>	<ul style="list-style-type: none"> <li>• SOLiD EZ Bead Emulsifier E120 Reagent Kit</li> <li>• SOLiD EZ Bead Emulsifier E120 Accessories Kit</li> <li>• SOLiD EZ Bead Amplifier E120 Accessories Kit</li> <li>• SOLiD EZ Bead Enricher E120 Reagent Kit</li> <li>• SOLiD EZ Bead Enricher Buffer Kit</li> <li>• SOLiD EZ Bead Enricher Accessories Kit</li> </ul>

<sup>†</sup> Applied Biosystems has validated this protocol using this specific material. Substitution may adversely affect system performance.

<sup>‡</sup> The kit includes consumables for all three instruments of the SOLiD EZ Bead System: the Emulsifier, Amplifier, and Enricher.

## Required consumables

### Required consumables

Item <sup>†</sup>	Source
Ethylene glycol	American Bioanalytical AB00455-01000
1.5-mL DNA LoBind Tubes	Eppendorf 022431021
(Falcon®) high-clarity polypropylene conical centrifuge tube, 9400 RCF rating, sterile, 50 mL	Becton Dickinson 352070
BD™ slip-tip, disposable tuberculin syringe, 1 mL	Becton Dickinson 309602
BD™ syringe, Luer-Lok™ tip, 3 mL	Becton Dickinson 309585
Portable Pipet-Aid®, with 110V recharger	Drummond, 4-000-100
Portable Pipet-Aid®, with 220V recharger	Drummond, 4-000-200
Corning Stripette®, serological pipette, 10 mL	Corning 4488
Corning Stripette®, serological pipette, 25 mL	Corning 4489
Corning Stripette®, serological pipette, 50 mL	Corning 4490
Filtered pipettor tips	MLS‡

<sup>†</sup> Applied Biosystems has validated this protocol using this specific material. Substitution may adversely affect system performance.

<sup>‡</sup> For the SDS of any chemical not distributed by Applied Biosystems, contact the chemical manufacturer. Before handling any chemicals, refer to the SDS provided by the manufacturer, and observe all relevant precautions.

## Required equipment

Required equipment	
Item <sup>†</sup>	Source
SOLiD EZ Bead Emulsifier The system includes: <ul style="list-style-type: none"> <li>• SOLiD EZ Bead Emulsifier</li> <li>• <i>Applied Biosystems SOLiD® EZ Bead™ Emulsifier Getting Started Guide</i> and <i>Applied Biosystems SOLiD® EZ Bead™ Emulsifier Quick Reference Card</i></li> </ul>	Applied Biosystems 4448419
Covaris® S2 System  (110 V for U.S. customers) (220 V for international customers)  The system includes: <ul style="list-style-type: none"> <li>• Covaris® S2 sonicator</li> <li>• Latitude® laptop from Dell Inc.</li> <li>• MultiTemp III Thermostatic Circulator</li> <li>• Covaris®-2 series Machine Holder for (one) 1.5-mL microcentrifuge tube</li> <li>• Covaris®-2 series Machine Holder for (one) 0.65-mL microcentrifuge tube</li> <li>• Covaris®-2 series Machine Holder for (one) 13 mm × 65 mm tube</li> <li>• Covaris®-2 Series Machine Holder for (one) microTUBE</li> <li>• Covaris® microTUBE Prep Station</li> <li>• Covaris® Water Tank Label Kit</li> <li>• Covaris® microTUBEs (1 pack of 25)</li> </ul> For system materials summary, refer to "Covaris® S2 System Materials Summary," in the <i>SOLiD® 4 System Site Preparation Guide</i> (Part no. 4448639).	<ul style="list-style-type: none"> <li>• Applied Biosystems 4387833 (110 V)</li> <li>• Applied Biosystems 4392718 (220 V)</li> </ul> or Covaris®
6-Tube Magnetic Stand	Applied Biosystems AM10055
Analytical balance, 250-g capacity	Major Laboratory Supplier (MLS) <sup>‡</sup>
Vortexer	MLS
Pipettors, 20 µL	MLS

**Required equipment**

Item <sup>†</sup>	Source
Pipettors, 200 µL	MLS
Pipettors, 1000 µL	MLS
Ice bucket	MLS
Picofuge	MLS

† Applied Biosystems has validated this protocol using this specific material. Substitution may adversely affect system performance.

‡ For the SDS of any chemical not distributed by Applied Biosystems, contact the chemical manufacturer. Before handling any chemicals, refer to the SDS provided by the manufacturer, and observe all relevant precautions.

## Optional equipment

### Optional equipment

Item <sup>†</sup>	Source
SOLiD EZ Bead Amplifier The system includes: <ul style="list-style-type: none"> <li>• SOLiD EZ Bead Amplifier</li> <li>• 220-V power cable</li> <li>• Pouch filling station</li> <li>• Pouch frame</li> <li>• Netbook and cables</li> <li>• USB cord (connecting cord)</li> <li>• <i>Applied Biosystems SOLiD EZ Bead Amplifier Getting Started Guide</i> and <i>Applied Biosystems SOLiD EZ Bead Amplifier Quick Reference Card</i></li> </ul>	Applied Biosystems 4448418
SOLiD EZ Bead Enricher The system includes: <ul style="list-style-type: none"> <li>• SOLiD EZ Bead Enricher</li> <li>• 220-V power cable</li> <li>• Waste bottle<sup>‡</sup></li> <li>• Small bottle racks with bottles attached<sup>‡</sup></li> <li>• Large bottle racks with bottles attached<sup>‡</sup></li> <li>• Laptop and cables</li> <li>• USB cord (connecting cord)</li> <li>• <i>Applied Biosystems SOLiD® EZ Bead™ Enricher Getting Started Guide</i> and <i>Applied Biosystems SOLiD® EZ Bead™ Enricher Quick Reference Card</i></li> </ul>	Applied Biosystems 4448420

<sup>†</sup> Applied Biosystems has validated this protocol using this specific material. Substitution may adversely affect system performance.

<sup>‡</sup> Supplied inside the instrument.



# B

## Troubleshooting

Observation	Possible cause	Recommended action
Aqueous phase not pumped into oil phase	Tubing or pump cassette not properly installed	<p>If <i>no</i> aqueous phase has reached the oil phase:</p> <ol style="list-style-type: none"> <li>1. Press stop button twice to stop run.</li> <li>2. Correctly install tubing in pump cassette (see the “Install the oil phase” procedure <a href="#">on page 18</a>, <a href="#">page 26</a>, or <a href="#">page 34</a>).</li> <li>3. Correctly position pinch wheel.</li> <li>4. Swirl the AQ Tube until the suspension is uniformly brown, then immediately load the AQ tube in instrument.</li> <li>5. Restart run.</li> </ol>





# The Covaris® S2 System

This appendix covers:

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Fill the tank .....	60
De-gas the water .....	60
Set the chiller .....	60
Perform required maintenance of the Covaris® S2 System .....	60
■ <b>Covaris® S2 programs</b> .....	61
Bead Block Declump .....	61
Covalent Declump 1 .....	61
Covalent Declump 3 .....	61

## Operation notes

**Note:** For important instrument safety information, refer to the Covaris® S2 System manual.

**Fill the tank** Fill the tank with fresh deionized water to the proper fill line (fill-line level “15” is recommended). The water should cover the visible part of the tube.

**De-gas the water** De-gas the water for 30 minutes. To maintain de-gassed water, keep the pump continuously on during operation and sample processing.

**Set the chiller** Set the chiller temperature to between 2°C to 5°C to ensure that the temperature reading in the water bath displays 5°C. The circulated water chiller should be supplemented with 20% ethylene glycol.

### Perform required maintenance of the Covaris® S2 System

The Covaris® S2 System requires regular maintenance to work properly. Perform the tasks in the table below (see [Table 10](#)):

Table 10 Required maintenance of the Covaris® S2 System

Required maintenance task	Frequency to perform task
De-gas water for 30 minutes prior to use	Before every use
Change water	Daily
Clean with bleach	Every two weeks

## Covaris® S2 programs

### Bead Block Declump

**Table 11** Bead Block Declump: 1 cycle Treatment 1 followed by 1 cycle Treatment 2

	Treatment 1	Treatment 2
Duty Cycle	1%	5%
Intensity	5	5
Cycles/Burst	50	100
Time	5 sec	60 sec
Target wattage power performance estimate (W)‡	2	10

‡ Not programmed.

### Covalent Declump 1

**Table 12** Covalent Declump 1: 1 cycle Treatment 1 followed by 1 cycle Treatment 2

	Treatment 1	Treatment 2
Duty Cycle	2%	5%
Intensity	6	9
Cycles/Burst	100	100
Time	5 sec	30 sec
Target wattage power performance estimate (W)‡	4	15

‡ Not programmed.

### Covalent Declump 3

**Table 13** Covalent Declump 3: 3 cycles: Treatment 1 followed by Treatment 2

	Treatment 1	Treatment 2
Duty Cycle	2%	5%
Intensity	6	9
Cycles/Burst	100	100
Time	5 sec	30 sec
Target wattage power performance estimate (W)‡	4	15

‡ Not programmed.



## **Appendix C** The Covaris® S2 System

*Covaris® S2 programs*



# Instrument Warranty Information

This appendix covers:

- Computer configuration ..... 64
- Limited product warranty ..... 64
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## Computer configuration

Applied Biosystems supplies or recommends certain configurations of computer hardware, software, and peripherals for use with its instrumentation. Applied Biosystems reserves the right to decline support for or impose extra charges for supporting nonstandard computer configurations or components that have not been supplied or recommended by Applied Biosystems. Applied Biosystems also reserves the right to require that computer hardware and software be restored to the standard configuration prior to providing service or technical support. For systems that have built-in computers or processing units, installing unauthorized hardware or software may void the Warranty or Service Plan.

## Limited product warranty

**Limited warranty** Applied Biosystems warrants that all standard components of its SOLiD® EZ Bead™ Emulsifier, SOLiD® EZ Bead™ Amplifier, or SOLiD® EZ Bead™ Enricher will be free of defects in materials and workmanship for a period of one (1) year from the date the warranty period begins. Applied Biosystems will repair or replace, at its discretion, all defective components during this warranty period. After this warranty period, repairs and replacement components may be purchased from Applied Biosystems at its published rates. Applied Biosystems also provides service agreements for post-warranty coverage. Applied Biosystems reserves the right to use new, repaired, or refurbished instruments or components for warranty and post-warranty service agreement replacements. Repair or replacement of products or components that are under warranty does not extend the original warranty period.

Applied Biosystems warrants that all optional accessories supplied with its SOLiD EZ Bead Emulsifier, SOLiD EZ Bead Amplifier, or SOLiD EZ Bead Enricher, such as peripherals, will be free of defects in materials and workmanship for a period of ninety (90) days from the date the warranty begins. Applied Biosystems will repair or replace, at its discretion, defective accessories during this warranty period. After this warranty period, Applied Biosystems will pass on to the buyer, to the extent that it is permitted to do so, the warranty of the original manufacturer for such accessories.

With the exception of consumable and maintenance items, replaceable products or components used on or in the instrument are themselves warranted to be free of defects in materials and workmanship for a period of ninety (90) days.

Applied Biosystems warrants that chemicals and other consumable products will be free of defects in materials and workmanship when received by the buyer, but not thereafter, unless otherwise specified in documentation accompanying the product.

Applied Biosystems warrants that for a period of ninety (90) days from the date the warranty period begins, the tapes, diskettes, or other media bearing the operating software of the product, if any, will be free of defects in materials and workmanship under normal use. If there is a defect in the media covered by the above warranty and the media is returned to Applied Biosystems within the ninety (90) day warranty period, Applied Biosystems will replace the defective media.

Applied Biosystems does not warrant that the operation of the instrument or its operating software will be uninterrupted or error free.



<b>Warranty period effective date</b>	Any applicable warranty period under these sections begins on the earlier of the date of installation or ninety (90) days from the date of shipment for hardware and software installed by Applied Biosystems personnel. For all hardware and software installed by the buyer or anyone other than Applied Biosystems, and for all other products, the applicable warranty period begins the date the product is delivered to the buyer.
<b>Warranty claims</b>	Warranty claims must be made within the applicable warranty period, or, for chemicals or other consumable products, within thirty (30) days after receipt by the buyer.
<b>Warranty exceptions</b>	The above warranties do not apply to defects resulting from misuse, neglect, or accident, including without limitation: operation with incompatible solvents or samples in the system; operation outside of the environmental or use specifications or not in conformance with the instructions for the instrument system, software, or accessories; improper or inadequate maintenance by the user; installation of software or interfacing, or use in combination with software or products, not supplied or authorized by Applied Biosystems; modification or repair of the product not authorized by Applied Biosystems, relocation or movement of the instrument by Customer or any third party not acting on behalf of AB; or intrusive activity, including without limitation computer viruses, hackers or other unauthorized interactions with instrument or software that detrimentally affects normal operations. Without limiting the abovementioned and for avoidance of doubt, computer hardware, monitors, accessories, software or other products not purchased from or supplied by Applied Biosystems ("Non-AB Product") are not covered under the foregoing warranty even if such Non-AB Product is integral to functional use of an Applied Biosystems product.
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THIS WARRANTY IS LIMITED TO THE BUYER OF THE PRODUCT FROM APPLIED BIOSYSTEMS AND IS NOT TRANSFERABLE.

Some countries or jurisdictions limit the scope of or preclude limitations or exclusion of warranties, of liability, such as liability for gross negligence or willful misconduct, or of remedies or damages, as or to the extent set forth above. In such countries and jurisdictions, the limitation or exclusion of warranties, liability, remedies or damages set forth above shall apply to the fullest extent permitted by law, and shall not apply to the extent prohibited by law.

## Damages, claims, and returns

- Damages** If shipping damage to the product is discovered, contact the shipping carrier and request inspection by a local agent. Secure a written report of the findings to support any claim. Do not return damaged goods to Applied Biosystems without first securing an inspection report and contacting Applied Biosystems Technical Support for a Return Authorization (RA) number.
- Claims** After a damage inspection report is received by Applied Biosystems, Applied Biosystems will process the claim unless other instructions are provided.
- Returns** Do not return any material without prior notification and authorization.
- If for any reason it becomes necessary to return material to Applied Biosystems, contact Applied Biosystems Technical Support or your nearest Applied Biosystems subsidiary or distributor for a return authorization (RA) number and forwarding address. Place the RA number in a prominent location on the outside of the shipping container, and return the material to the address designated by the Applied Biosystems representative.



# Safety

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## Instrumentation safety

**Note:** The products accompanying this manual are for demonstration purposes only and are not for sale.

### Symbols on instruments



#### Electrical symbols on instruments



The following table describes the electrical symbols that may be displayed on Life Technologies instruments.

Symbol	Description
	Indicates the <b>On</b> position of the main power switch.
	Indicates the <b>Off</b> position of the main power switch.
	Indicates a standby switch by which the instrument is switched on to the <b>Standby</b> condition. Hazardous voltage may be present if this switch is on standby.
	Indicates the <b>On/Off</b> position of a push-push main power switch.
	Indicates a terminal that may be connected to the signal ground reference of another instrument. This is not a protected ground terminal.
	Indicates a protective grounding terminal that must be connected to earth ground before any other electrical connections are made to the instrument.
	Indicates a terminal that can receive or supply alternating current or voltage.
	Indicates a terminal that can receive or supply alternating or direct current or voltage.

#### Safety symbols


The following table describes the safety symbols that may be displayed on Life Technologies instruments. Each symbol may appear by itself or with text that explains the relevant hazard (see [“Safety labels on instruments” on page 8](#)). These safety symbols may also appear next to DANGERS, WARNINGS, and CAUTIONS that occur in the text of this and other product-support documents.

Symbol	Description
	Indicates that you should consult the manual for further information and to proceed with appropriate caution.
	Indicates the presence of an electrical shock hazard and to proceed with appropriate caution.

Symbol	Description
	Indicates a pinch hazard and to proceed with appropriate caution.
	Indicates the presence of a hot surface or other high-temperature hazard and to proceed with appropriate caution.

### Environmental symbols on instruments

The following symbol applies to all Applied Biosystems electrical and electronic products placed on the European market after August 13, 2005.




Symbol	Description
	<b>Do not dispose of this product as unsorted municipal waste.</b> Follow local municipal waste ordinances for proper disposal provisions to reduce the environmental impact of waste electrical and electronic equipment (WEEE). <b>European Union customers:</b> Call your local Applied Biosystems Customer Service office for equipment pick-up and recycling. See <a href="http://www.appliedbiosystems.com">www.appliedbiosystems.com</a> for a list of customer service offices in the European Union.

### Location of safety labels on instruments

The SOLiD® EZ Bead™ Emulsifier contains warnings at the locations shown below:

- The pinch hazard label is to the right of the pump head.
- The remaining labels are near the power input.

### General instrument safety

	<b>WARNING! PHYSICAL INJURY HAZARD.</b> Use this product only as specified in this document. Using this instrument in a manner not specified by Life Technologies may result in personal injury or damage to the instrument.
	<b>WARNING! PHYSICAL INJURY HAZARD.</b> Using the instrument in a manner not specified by Applied Biosystems may result in personal injury or damage to the instrument.
	<b>WARNING! PHYSICAL INJURY HAZARD.</b> Using this product in a manner not specified by Applied Biosystems may result in personal injury or damage to the instrument.

## Moving and lifting the instrument



**CAUTION! PHYSICAL INJURY HAZARD.** The instrument is to be moved and positioned only by the personnel or vendor specified in the applicable site preparation guide. If you decide to lift or move the instrument after it has been installed, do not attempt to lift or move the instrument without the assistance of others, the use of appropriate moving equipment, and proper lifting techniques. Improper lifting can cause painful and permanent back injury. Depending on the weight, moving or lifting an instrument may require two or more persons.

## Operating the instrument

Ensure that anyone who operates the instrument has:

- Received instructions in both general safety practices for laboratories and specific safety practices for the instrument.
- Read and understood all applicable Safety Data Sheets (SDSs). See [“About SDSs” on page 74](#).

## Cleaning or decontaminating the instrument



**CAUTION!** Before using a cleaning or decontamination method other than those recommended by the manufacturer, verify with the manufacturer that the proposed method will not damage the equipment.

## Physical hazard safety

### Pinch hazard



**CAUTION! PINCH HAZARD. Moving Parts. Moving parts can crush, pinch and cut. Keep hands clear of moving parts while operating the instrument. Disconnect power before servicing.**

### Solvents and pressurized fluids



**WARNING! PHYSICAL INJURY HAZARD.** Always wear eye protection when working with solvents or any pressurized fluids.

## Electrical safety




**WARNING! ELECTRICAL SHOCK HAZARD.** Severe electrical shock can result from operating the SOLiD EZ Bead Emulsifier without its instrument panels in place. Do not remove instrument panels. High-voltage contacts are exposed when instrument panels are removed from the instrument.

### Power



**WARNING! ELECTRICAL HAZARD.** Grounding circuit continuity is required for the safe operation of equipment. Never operate equipment with the grounding conductor disconnected.

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 **WARNING! ELECTRICAL HAZARD.** Use properly configured and approved line cords for the voltage supply in your facility.

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 **WARNING! ELECTRICAL HAZARD.** Plug the system into a properly grounded receptacle with adequate current capacity.

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## Fuses

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 **CAUTION!** Replace only with the same TYPE and RATING FUSE. Use only 250V, 2A SB fuses when replacing the fuse.

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## Overvoltage rating

The Emulsifier has an installation (overvoltage) category of II, and is classified as portable equipment.

## Workstation safety

Correct ergonomic configuration of your workstation can reduce or prevent effects such as fatigue, pain, and strain. Minimize or eliminate these effects by configuring your workstation to promote neutral or relaxed working positions.

---

 **CAUTION! MUSCULOSKELETAL AND REPETITIVE MOTION HAZARD.** These hazards are caused by potential risk factors that include but are not limited to repetitive motion, awkward posture, forceful exertion, holding static unhealthy positions, contact pressure, and other workstation environmental factors.

---

To minimize musculoskeletal and repetitive motion risks:

- Use equipment that comfortably supports you in neutral working positions and allows adequate accessibility to the keyboard, monitor, and mouse.
- Position the keyboard, mouse, and monitor to promote relaxed body and head postures.

## Safety and electromagnetic compatibility (EMC) standards

This section provides information on:

- U.S. and Canadian safety standards
- Canadian EMC standard
- European safety and EMC standards
- Australian EMC Standards

### U.S. and Canadian safety standards



The Emulsifier has been tested to and complies with standard:

UL 61010-1:2nd Edition, CSA C22.2 No. 61010-1, "Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements."

#### **Canadian EMC standard**

This instrument has been tested to and complies with ICES-001, Issue 3: "Industrial, Scientific, and Medical Radio Frequency Generators."

#### **European safety and EMC standards**



Safety

This instrument meets European requirements for safety (Low Voltage Directive 2006/95/EC). This instrument has been tested to and complies with standards EN 61010-1:2001, "Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use, Part 1: General Requirements."

#### **EMC**

This instrument meets European requirements for emission and immunity (EMC Directive 2004/108/EC). This instrument has been tested to and complies with standard EN 61326 (Group 1, Class B), "Electrical Equipment for Measurement, Control and Laboratory Use – EMC Requirements."

#### **Australian EMC Standards**



This instrument has been tested to and complies with standard AS/NZS 2064, "Limits and Methods Measurement of Electromagnetic Disturbance Characteristics of Industrial, Scientific, and Medical (ISM) Radio-frequency Equipment."



## Chemical safety

### General chemical safety

### Chemical hazard warning



**WARNING! CHEMICAL HAZARD.** Before handling any chemicals, refer to the Safety Data Sheet (SDS) provided by the manufacturer, and observe all relevant precautions.



**WARNING! CHEMICAL HAZARD.** All chemicals in the instrument, including liquid in the lines, are potentially hazardous. Always determine what chemicals have been used in the instrument before changing reagents or instrument components. Wear appropriate eyewear, protective clothing, and gloves when working on the instrument.



**WARNING! CHEMICAL HAZARD.** Four-liter reagent and waste bottles can crack and leak. Each 4-liter bottle should be secured in a low-density polyethylene safety container with the cover fastened and the handles locked in the upright position. Wear appropriate eyewear, clothing, and gloves when handling reagent and waste bottles.



**WARNING! CHEMICAL STORAGE HAZARD.** Never collect or store waste in a glass container because of the risk of breaking or shattering. Reagent and waste bottles can crack and leak. Each waste bottle should be secured in a low-density polyethylene safety container with the cover fastened and the handles locked in the upright position. Wear appropriate eyewear, clothing, and gloves when handling reagent and waste bottles.

### Chemical safety guidelines

To minimize the hazards of chemicals:

- Read and understand the SDSs provided by the chemical manufacturer before you store, handle, or work with any chemicals or hazardous materials. (See [“About SDSs” on page 74.](#))
- Minimize contact with chemicals. Wear appropriate personal protective equipment when handling chemicals (for example, safety glasses, gloves, or protective clothing). For additional safety guidelines, consult the SDS.
- Minimize the inhalation of chemicals. Do not leave chemical containers open. Use only with adequate ventilation (for example, fume hood). For additional safety guidelines, consult the SDS.
- Check regularly for chemical leaks or spills. If a leak or spill occurs, follow the manufacturer’s cleanup procedures as recommended in the SDS.
- Comply with all local, state/provincial, or national laws and regulations related to chemical storage, handling, and disposal.

## SDSs

### About SDSs

Chemical manufacturers supply current Safety Data Sheets (SDSs) with shipments of hazardous chemicals to new customers. They also provide SDSs with the first shipment of a hazardous chemical to a customer after an SDS has been updated. SDSs provide the safety information you need to store, handle, transport, and dispose of the chemicals safely.

Each time you receive a new SDS packaged with a hazardous chemical, be sure to replace the appropriate SDS in your files.

### Obtaining SDSs

The SDS for any chemical supplied by Life Technologies is available to you free 24 hours a day. To obtain SDSs:

1. Go to [www.appliedbiosystems.com](http://www.appliedbiosystems.com), click **Support**, then select **SDS**.
2. In the Keyword Search field, enter the chemical name, product name, SDS part number, or other information that appears in the SDS of interest. Select the language of your choice, then click **Search**.
3. Find the document of interest, right-click the document title, then select any of the following:
  - **Open** – To view the document
  - **Print Target** – To print the document
  - **Save Target As** – To download a PDF version of the document to a destination that you choose

**Note:** For the SDSs of chemicals not distributed by Applied Biosystems, contact the chemical manufacturer.

## Chemical waste safety

### Chemical waste hazards



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**CAUTION! HAZARDOUS WASTE.** Refer to Safety Data Sheets and local regulations for handling and disposal.

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**WARNING! CHEMICAL WASTE HAZARD.** Wastes produced by Applied Biosystems instruments are potentially hazardous and can cause injury, illness, or death.

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**WARNING! CHEMICAL STORAGE HAZARD.** Never collect or store waste in a glass container because of the risk of breaking or shattering. Reagent and waste bottles can crack and leak. Each waste bottle should be secured in a low-density polyethylene safety container with the cover fastened and the handles locked in the upright position. Wear appropriate eyewear, clothing, and gloves when handling reagent and waste bottles.

---

## Chemical waste safety guidelines

To minimize the hazards of chemical waste:

- Read and understand the Safety Data Sheets (SDSs) provided by the manufacturers of the chemicals in the waste container before you store, handle, or dispose of chemical waste.
- Provide primary and secondary waste containers. (A primary waste container holds the immediate waste. A secondary container contains spills or leaks from the primary container. Both containers must be compatible with the waste material and meet federal, state, and local requirements for container storage.)
- Minimize contact with chemicals. Wear appropriate personal protective equipment when handling chemicals (for example, safety glasses, gloves, or protective clothing). For additional safety guidelines, consult the SDS.
- Minimize the inhalation of chemicals. Do not leave chemical containers open. Use only with adequate ventilation (for example, fume hood). For additional safety guidelines, consult the SDS.
- Handle chemical wastes in a fume hood.
- After emptying a waste container, seal it with the cap provided.
- Dispose of the contents of the waste tray and waste bottle in accordance with good laboratory practices and local, state/provincial, or national environmental and health regulations.

## Waste disposal

If potentially hazardous waste is generated when you operate the instrument, you must:

- Characterize (by analysis if necessary) the waste generated by the particular applications, reagents, and substrates used in your laboratory.
  - Ensure the health and safety of all personnel in your laboratory.
  - Ensure that the instrument waste is stored, transferred, transported, and disposed of according to all local, state/provincial, and/or national regulations.
- IMPORTANT!** Radioactive materials may require special handling, and disposal limitations may apply.

## Safety alerts

For the definitions of the alert words **IMPORTANT**, **CAUTION**, **WARNING**, and **DANGER**, see [“Safety alert words” on page 8](#).

### Specific alerts for instrumentation



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**CAUTION! PINCH HAZARD. Moving Parts. Moving parts can crush, pinch and cut. Keep hands clear of moving parts while operating the instrument. Disconnect power before servicing.**

# Documentation and Support

## Related documentation

For the latest documentation on the SOLiD® EZ Bead™ System and SOLiD System, go to:

[http://www3.appliedbiosystems.com/AB\\_Home/Support/index.htm](http://www3.appliedbiosystems.com/AB_Home/Support/index.htm)

## Obtaining support

For the latest services and support information for all locations, go to:

[www.lifetechnologies.com](http://www.lifetechnologies.com).

At the Life Technologies web site, you can:

- Access worldwide telephone and fax numbers to contact Life Technologies Technical Support and Sales facilities.
- Search through frequently asked questions (FAQs).
- Submit a question directly to Technical Support.
- Order Life Technologies user documents, SDSs, certificates of analysis, and other related documents.
- Download PDF documents.
- Obtain information about customer training.
- Download software updates and patches.



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